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THE INCORPORATION OF ENVIRONMENTAL PERCEPTION INFORMATION INTO WILDERNESS PARK SAFETY PLANNING

BY

THOMAS CRAIG WALDICHUK
B.A., Carleton University, 1984
Extended Studies Diploma, Simon Fraser University, 1985

THESIS
SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE MASTER OF ARTS DEGREE
WILFRID LAURIER UNIVERSITY
1987

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Abstract

The park safety planning process currently in use limits users' inputs to accident statistics. It would be better to more accurately anticipate accident-prone locations and to take preventative measures. A planning methodology is proposed which integrates the safety perceptions of park users into the decision-making for locating facilities and services; the Recreation Opportunity Spectrum (ROS) serves as a systematic planning guide for such decision-making and is compatible with park policy and objectives. Applications to Garibaldi Provincial Park, British Columbia, and statistical and cartographic analyses of 273 questionnaires returned from there, indicate that park users' perceptions can be advantageously incorporated into safety management planning. A sequence of steps for identifying and planning locations is developed and is applicable to other parks as well.

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To David:

I know it's been a long time ... but don't worry, we'll hike and ski together again some day.

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CHAPTER ONE

INTRODUCTION

1.1 The Problem

Park safety planning tends to take very little advantage of the public's experiences there. Generally, input from park users has been limited to the reports and statistics of accidents in which people are involved. The problem inherent in this approach to safety planning is that social costs can be very high: planning is based on accidents which could have been prevented. But with knowledge of how people behave in the natural environment, parks can be better planned to minimize the chance of accidents. Such information can then be put into a systematic park planning framework so that the maximum number of desired experiences of the park users will be satisfied (Clark and Stankey, 1979).

The analysis of human behaviour as a means of ameliorating park dangers has received minimal recognition in the past. The reason for this lack of knowledge is in part due to the time and cost of observing behaviour. For example, McDonald and Hammitt (1982) did utilize behavioural observations while studying inner-tube safety on two rivers in American parks in the southeast Appalachians, but found that this study approach was very time consuming. Likewise, Stuart (1978), while developing management models for the human use of grizzly bear habitat, found the collection of bear-human contact data to be limited and further data gathering costly. In natural hazards applications, Schiff (1970) concluded that whereas direct observation may be the most

accurate predictor of recurring human behaviour, the time and costs involved make it nearly impossible, and that in certain situations perceptions of people can be used to predict their behaviour (Schiff, 1970).

Park planners and managers have become much more aware of the user with the advent of experienced-based planning (Driver and Brown, 1983; Knopf, 1983; Manfredo et al., 1983). The motivations and desired experiences of park users has received considerable attention for planning recreation areas. This experienced-based planning approach has become more systematic with the development of the Recreation Opportunity Spectrum (ROS). In the ROS, safety facilities have been accounted for in onsite management (Clark and Stankey, 1979); however, environmental perceptions have yet to be considered as an aid to decide when and where these facilities are needed.

Thus, the role of environmental perception in park safety planning must change. In the past, safety planning has been based on managers' predictions of user behaviour and on managers' perceptions of the environment. It is proposed here that the public have a role in the safety planning process, that their environmental perceptions be incorporated into decision-making, not just park managers'. Such public participation is needed to make safety planning effective in reducing the number of deaths and injuries in the park while having minimal impact both on the park user's desired experiences and on the environment.

The goal of this study is to improve park safety planning by incorporating the environmental perceptions of the various user groups.

There are various possibilities for incorporating park users' perceptions into safety planning:

1) As a key component of an existing master plan for a park.
2) As an addition to a behavioural data base for the development of safety plans for newly created parks.
3) As an aid to rank areas for safety management using existing park management plans -- and to show how it could be done in an actual park. Case study example is Garibaldi Park, British Columbia.
4) As a component with the above three planning scenarios, using the ROS.

My hope is that this can both improve the park users' experiences and ease managements' problems.

Even though my findings and recommendations should be widely applicable, because my emphasis is practical and applied it seemed appropriate to undertake this study with a particular park in mind.

1.2 The Choice Of Garibaldi Provincial Park As A Case Study

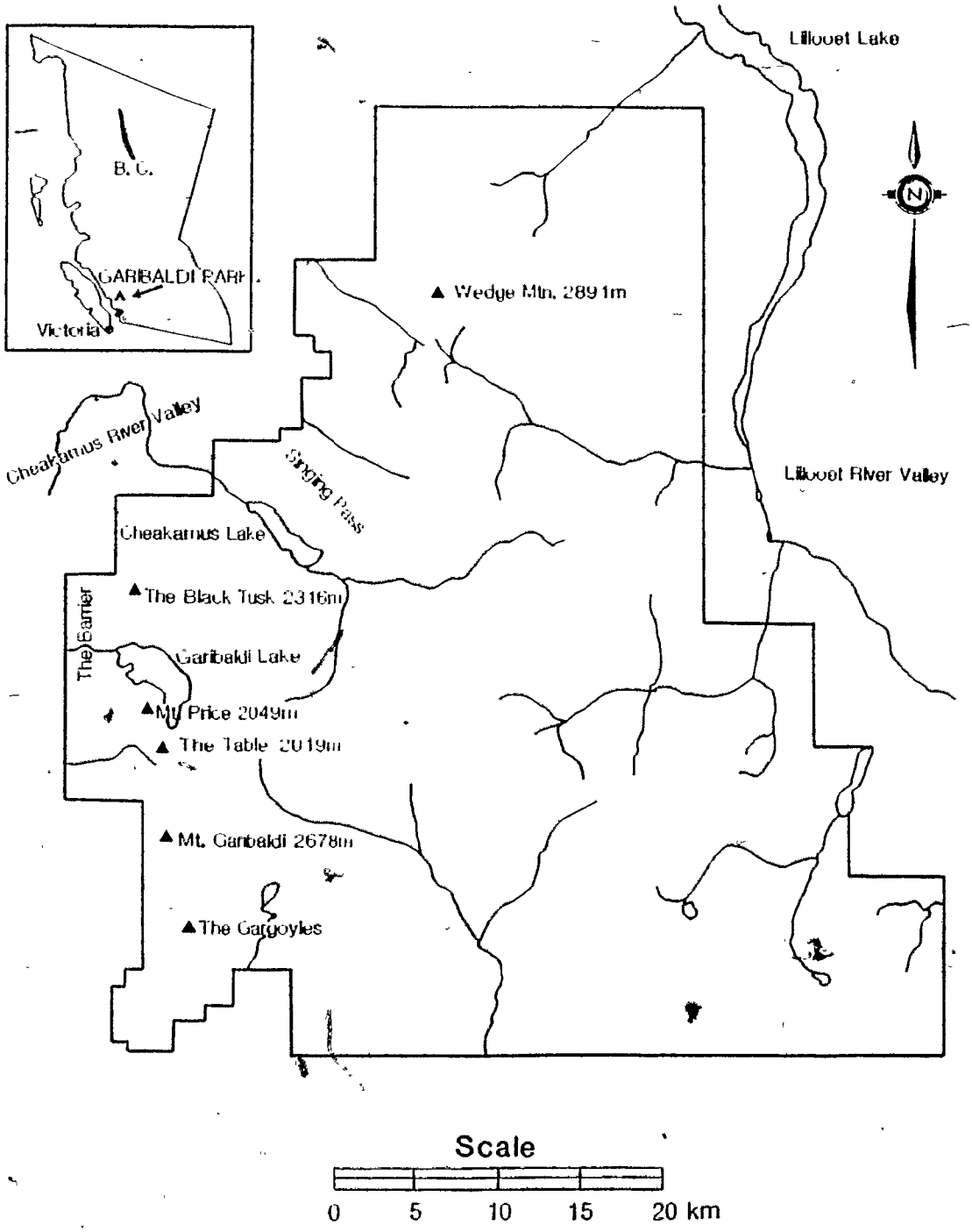
Garibaldi Provincial Park, located in Southwestern British Columbia in the Coast Mountain range, covers 195,000 hectares of mountain wilderness and lies 65 kilometres directly north of Vancouver (British Columbia, Ministry of Lands, Parks and Housing, 1986) (Figure 1). The park is bordered on the east side by the Lillooet River Valley Trench and on the west side by the Cheakamus and Pitt River valleys. The highest peak in the park is Mt. Wedge at 2891 metres (British Columbia, Ministry of Lands, Parks and Housing, 1986). Due to the low elevation of the valleys, there is high relief (British Columbia, 1932).

The overall climate of Garibaldi Park is humid temperate. At the lower elevations, there is a coastal rain forest. In the winter-time,

Figure 1

GARIBALDI PROVINCIAL PARK

BRITISH COLUMBIA



Base Map Source: (British Columbia, 1986)

a snow belt develops due to the prevailing westerly winds. At the lower elevations, snow is on the ground for about five months each year. The tree line occurs at about 1800 metres (Garibaldi Advisory Panel, 1978).

The geologic history of Garibaldi Park is that of the rest of the Coast Mountains. The Coast Range was created during the Jurassic Period by a mass of intrusive igneous rock called Coast Batholith. The Batholith is responsible for the present height and character of the mountains (British Columbia, 1932).

The geologic history of the park is dominated by volcanism. Many of the landforms present have resulted from volcanic processes occurring between the two glacial periods of the Pleistocene Period (British Columbia, 1932). The Black Tusk and Table Mountain are volcanic plugs made of hard basalt, which formed in the vent of volcanoes (British Columbia, 1932) (Figure 2). Mount Garibaldi also originated from volcanic processes (British Columbia, 1932).

Various hazards are present in Garibaldi Park. The Barrier is a 500 metre cliff of unstable volcanic rock formed by a lava eruption near Mt. Price (Figure 3). Behind the natural dam of The Barrier, Garibaldi Lake has developed (British Columbia, Ministry of Lands, Parks and Housing, 1986). Studies have been conducted on The Barrier to determine the possibility of another landslide like the catastrophic one of the 1850's (Garibaldi Advisory Panel, 1978). Mount Garibaldi is a volcanic centre in the region; thus, an earthquake could occur and trigger a slide on the geologically unstable Barrier (Garibaldi Advisory Panel, 1978). Even without an earthquake, during warm weather

Figure 2 (left)

THE BLACK TUSK AS SEEN DURING THE LATE SPRING. HIKERS CLIMB THE PEAK FROM THE BACK SIDE.

Figure 3 (above)

THE BARRIER AS SEEN FROM THE ADJACENT HIKING TRAIL.

it is possible for blocks to break off from the top of The Barrier and fall 120 to 150 metres to the steep apron below (Mathews, 1975). In fact, during the night of December 24-25, 1977, a noticeable rockfall occurred from the The Barrier at the head of Rubble Creek (Garibaldi Advisory Panel, 1978). Other hazardous areas occur on the eastern and northwestern faces of the Black Tusk (Mathews, 1975). In addition, the tongues of many glaciers are easily accessible to park users (British Columbia, 1932), which may encourage glacial travel.

The present study uses Garibaldi Park as a case study of safety planning for the following reasons. First, within the park there are a variety of natural hazards, including those that are associated with specific activities. Second, there are a variety of activities which are undertaken in the park, including those classified as high risk. Third, some explicit management does occur in this park -- for example, campsite areas and mountain huts. Thus, adding some safety facilities or services would not be out of line with the park's predominant wilderness character. Finally, Garibaldi Park is only about a one and one-half hour drive north of Vancouver; thus, it receives a great deal of use.

1.3 Limitations and Definitions

No study can cover everything. This study investigates safety pertaining to the environment-user relationship during the summer season. Safety from crime is not considered, nor is safety where it pertains solely to the built environment -- for example, on a highway passing through a park, or the structural safety of park buildings.

There has to be some input from the natural environment for consideration in this study.

In this study, a hazard is equivalent to a source of danger. Hazards are categorized on a continuum from objective to subjective (Paulcke and Dumler, 1973). Objective hazards are inherent in the natural environment -- for example, a waterfall. Subjective hazards are those dependent on the park user (human hazards) -- for example, a poor judgement of distance, or over-confidence. From each end of the continuum the objective or subjective hazardousness decreases to zero at the other end. The continuum concept demonstrates that each hazard will have a subjective and an objective component which will vary in importance according toward which extreme of the continuum the hazard is classified.

Risk is the range of possible outcomes resulting from a course of action taken by a wilderness park user -- for example, the possibility of twisting an ankle if hiking in the dark (Smith, 1983).

In this study, perception is broadly defined to include awareness, cognizance or knowledge, attitudes, ideas, and feelings (Saarinen, 1976). Environmental perception is defined as the subjective experiential evaluations of the environment -- for example, awareness -- which surrounds a wilderness park user or a wilderness park manager (Billinge, 1983). It includes the perception of hazards, and the perception of risk. The behaviour and precautions taken as a result of environmental perception will also be considered.

Site planning refers to the precise location of a facility or service; area planning refers to the larger area or zone in which the

facility or service site is located.

In this study the three terms, facilities, services and regulations, will be referred to collectively as " safety management." "Safety planning" is the locational decision-making of safety management.

Facilities can be any structure within a park which increases public safety -- for example, a first-aid cache or trail markers (United States, 25 April 1983, 10 October 1980). Other structures such as warming huts and public telephones serve the dual purpose of visitor comfort and safety. Services, as defined here, do not alter the physical landscape with permanent structures. Services, too, can be directly related to safety -- for example, a cross-country ski patroller (MacInnes, 1972), or indirectly related to safety -- for example, an information brochure containing a map. Regulations in the form of zoning may prohibit visitors in certain areas of the park for safety reasons. Behavioural regulations may also limit or prohibit certain activities for safety reasons (Christiansen, 1985; Gold, 1983).

In this thesis, unless otherwise stated, accidents will refer to incidents where personal injury occurs -- for example, a twisted ankle and incidents where search and rescue is involved -- for example, people lost or overdue.

1.4 Overview Of Chapters

This thesis is divided into three general sections. The first section, Chapters Two and Three, examines the park users and the effect their perceptions have on safety of users. The second section, Chapter

Four, examines the role of the park manager and whether user perceptions have been adequately considered in park safety management. The third section, Chapter Five, discusses possible safety planning scenarios which incorporate park users' perceptions and other user characteristics.

Within the first section, Chapter Two investigates how the park user has been considered in the literature and in environmental perception studies. Chapter Three introduces my risk and hazard perception study of Garibaldi Park and interprets the questionnaire responses in terms of risk and hazard perception theory.

Chapter Four considers the park manager as a component of park safety. Decision-making theory at the park level and land management systems for recreation is reviewed, both generally and for Garibaldi Park.

Chapter Five shows particular uses of perception information in planning safety: for creating a safety plan whether for an established park or for a newly created park, for establishing priorities of park areas to be considered, and for incorporation with the Recreation Opportunity Spectrum. Garibaldi Provincial Park is used as a case study for operationalizing the recommended procedures.

In Chapter Six, summaries are made and conclusions drawn.

CHAPTER TWO

THE EFFECT OF USER PERCEPTIONS ON SAFETY AND EXPERIENCES OF PARK USERS

It is first necessary to demonstrate that park users' perceptions influence the safety of users. If these perceptions are not a factor then their use in park safety planning is not warranted. Chapter Two will give a brief overview of risk and hazard perception studies in geographic and parks and recreation literature. The application of hazard and risk perception in geography to wilderness park safety will then be elaborated, followed by examples of park marketing studies and their usefulness for park safety planning.

I will discuss risk first because it focuses directly on the park user. Next the environmental component of accidents will be covered through a discussion about hazard perception. Finally, I want to bring into focus the usefulness of marketing studies which may not deal specifically with safety issues but disaggregate park users to help determine which user groups are most susceptible to accidents. The literature review in Chapter Two will form a knowledge base to which comparisons can be made when discussing the case study questionnaire results.

2.1 Risk Studies In Geographic And Parks And Recreation Literature

Risk has been covered extensively in geography literature, usually as a part of location studies of extreme geophysical events (Hewitt, 1983). There are two types of risk: objective and subjective. Objective risk can be calculated mathematically using statistics from

past events (Burton and Pushchak, 1984). The study of objective risk has been common in engineering and other disciplines where consequences of technological innovations could have a high human cost (Fernie and Pitkethy, 1980). Subjective risk on the other hand is perceived risk; it cannot be calculated mathematically (Burton and Pushchak, 1984). Only subjective risk is discussed in this thesis. Hereafter it is referred to as perceived risk. Mileti et al. (1975, as quoted in Mitchell, 1984, p.37) define risk perception as "...cognition or belief in the seriousness of the threat of an environmental extreme, as well as the subjective probability of experiencing a damaging environmental extreme."

Gilbert White and the Chicago School of Geographers in the 1940's, were the first people to develop the methodology for studying perceived risk related to geophysical events; studies involving hazardous technologies soon followed. They borrowed part of their methodology from psychology to measure perceived risk and the perception of adjustments to hazards (Fernie and Pitkethy, 1985).

Perceived risk in parks and recreation has been studied in terms of the psychological inputs and outcomes of certain recreational activities termed collectively as risk recreation. As a definition for risk in wilderness recreation, one could say that it consists of "... those activities which, to the participant, provide risk, challenge, or hazard" (Allen and Meier, 1982, p.48). The concept of a risk continuum from the positive aspects (challenge) to the negative aspects (danger) has been investigated (Johnston, 1987; Allen, 1980, as quoted in Johnston, 1987). The perception of risk along this continuum can be

affected by personal experience, improvements in equipment, group attitudes and approaches to the activity (Johnston, 1987). Therefore, perceived risk in recreation is considered in positive as well as negative terms, whereas in resource geography perceived risk only has negative connotations.

One reason people participate in risk recreation may be due to social background (Cox,1984; Allen and Meier, 1982). People with boring, unchallenging jobs are likely to partake of risk recreation (Klein, n.d., as quoted in Allen and Meier, 1982). Cox (1984) found that questionnaire respondents felt that past death and injury statistics were not a deterrent to participation in the activity. Carson (1983) found that first time participants at an older age perceived activities to have the most risk. Moreover, the motivation to initiate an activity may not be the same as the motivation to continue the activity (Allen and Meier, 1982). Many people derive experiences like challenge, self-test, escape (Meier, 1978), and uncertainty (Miles, 1978), from participating in risk recreation. For most people, the benefits derived from high risk recreation are known as intrinsic rewards; the activity is undertaken for its own sake (Carson, 1983). Clearly, there are a wide range of motivations, derived experiences, and benefits which together outweigh the possible safety consequences of risk recreation (Allen and Meier, 1982).

There are some spatial elements to the study of risk recreation. The location in which an activity is undertaken can affect the level of perceived risk in the activity and the experiences derived from that activity -- for example, mountain climbing in two completely different

physiographic areas (Carson, 1983). A spatial element may also exist due to people from urban areas becoming involved in risky activities more than rural inhabitants, due to boredom and perhaps a quest for adventure (Foster, 1985).

Perceived risk has the most relevancy to park safety. People cannot rationally calculate risk as can be done using mathematics (Burton and Pushchak, 1984). For example, the occurrence of catastrophic events will tend to be over-estimated (Fernie and Pitkethy, 1985). On the other hand, activities that people voluntarily participate in will have a lower perceived risk level than is actually the case (Foster, 1985; Burton and Pushchak, 1984). Furthermore, risks are perceived differently if children are involved (Burton and Pushchak, 1984), if the fate of another person is at stake (Foster, 1985) or if expected fatalities are to be grouped instead of randomly distributed (Burton and Pushchak, 1984). In general, society tolerates about the same amount of risk for voluntary activities as for disease (Foster, 1985).

From a geographical point of view there is a problem with many risk studies of the past as they apply to park safety. Most research has looked at activities -- which do not refer to location. Is the activity hazardous or is the location in which it takes place hazardous? Knopp (1972) felt that there should be more emphasis on the environmental component of recreation behaviour rather than the activity. Clearly, both activity and place need to be considered. There has been a lack of using the geographic risk perception models in a park environment. What related work has occurred is discussed in the

next section.

2.2 Hazard Research In Geographic And Parks And Recreation Literature

Hazard studies are closely related to risk studies since risk is the probability that a hazard will cause an unfortunate event. As in risk studies, it was Gilbert White and the Chicago School of Geographers who pioneered geophysical hazard research (Fernie and Pitkethy, 1985). Hazard perception studies evolved from a need to approach the human input of natural hazards from a different angle.

The initial concern was flooding (White, 1974). Dams and other technical solutions were tried at extreme costs -- often they failed. Then it was realized that by changing the settlement pattern of the area, that is the human use component, the human impact of flooding would be decreased -- the original goal. Thus, there was a move from structural techniques -- for example, dams -- to non-structural techniques -- such as land use regulations -- to lessen the impact of hazards. Studying the perception of these hazards became an important component of the hazard research paradigm (White, 1974). Studies of hazards have expanded over the years and have come to include biological products, toxic substances, and social violence (Mitchell, 1984).

The methodology of hazard perception studies is not well defined (Mitchell, 1984). Commonly, each author will define perception as he or she sees fit; however, the working definition has tended to be broader than the psychological interpretation, so that coping with hazards was included (White, 1974). Other methodological problems

arise when trying to obtain study results, that is, how does one get the information from the people: questionnaires, interviews, other data collection techniques?

Much of the hazard perception methodology has been borrowed from psychology. Locus of control studies which try to determine whether a population feels it has control over its destiny in times of a disaster (e.g. Simpson-Housley, 1979; Wong, 1979). People with external locus of control are generally those who fail to take adjustments against hazards (Mitchell, 1984). Because of the limited studies involving locus of control, it is difficult to say whether it works in explaining hazard perception (Mitchell, 1984). Another approach, borrowed from psychology, the repression sensitization technique, can be combined with locus of control theory (Mitchell, 1984); it was used by Simpson-Housley (1979) while studying earthquake hazards in New Zealand and involves classifying people into one group that rationalizes the situation through discussion (repressors) and another group that has other people assure them that the situation is stable (sensitizers).

Parks and recreation does not have an established hazard perception literature. No established research paradigm exists. The wealth of hazard research in geography has rarely been applied to a parks and recreation context (an exception is -- for example, Sutherland, 1984).

Most hazard perception studies in geography have dealt with human settlements; unlike settlements, people are mobile in parks. Thus, they do not have the same amount of time (experience) to develop the same spatially related perceptions as in a settlement. This difference

in hazard perception was noted by Sutherland (1984) in his study of avalanche perception.

Working definitions of recreation hazards have varied. Paulcke and Dumler (1973) have defined hazards in terms of mountaineering. They define an objective hazard as one inherent in the landscape -- for example, a cliff. Subjective hazards are those inherent in the person -- for example, over-confidence. A causative hazard is a subjective hazard which results from an objective hazard -- for example, upon seeing an avalanche, one panics and skis over a cliff (Paulcke and Dumler, 1973). Environment Canada, Parks, in their Visitor Activity Management Process, similarly classify hazards (Canada, Environment Canada, Parks, 1986). Christiansen defines a hazard as a "...physical or environmental condition that may cause or attribute to an accident" (Christiansen, 1977, p.234).

Much of the parks and recreation literature has dealt with hazard classification. Christiansen (1977) mentions subjective hazards in terms of unsafe acts, and the causes of those unsafe acts: negligence, ignorance, or irresponsibility. He also mentions physical hazards in terms of environmental conditions. Christiansen also stated that there are biological hazards: bees, bears and vegetation, for example. Hazards as a result of direct human impact -- for example, drinking polluted stream water -- have also been considered (United States, April 1983; Christiansen, 1977). While these concepts are important for the recreationist to consider, they should also be considered by park managers and planners.

As with perceived risk, hazards in recreation can be regarded by

planners and managers in positive as well as negative terms. For example, grizzly bears can enhance a park user's experience if they are viewed from a distance. As well, geologic resource attributes such as The Black Tusk in Garibaldi Park can increase the recreation opportunities. In resource geography a hazard would carry negative connotations -- for example, polluted streams for drinking.

The causes of park accidents has been written about generally and non-empirically. However, there exists a concern for hazards and human response to them. In the Seattle Mountaineers' Mountaineering - the Freedom of the Hills, one of the chapters deals with mountain safety:

> "Subjective dangers are present on every climb. Their control lies in awareness of all the varied factors which influence judgement and decision-making in the mountains.... The weakness of one safety factor is neutralized by the strengthening of others" (Ferber, 1974, p.310, 313).

The biggest cause of accidents in U.S. National Parks is lack of visitor recognition of environmental hazards (Sholly, as quoted in Toops, 1985). Christiansen (1977) emphasizes place: he states that people are attracted to natural edges and borders -- for example, the edge of a cliff; and he comments that certain areas pose particular hazards -- for example, there is a hazard of falling in rockslide areas: open shafts, caves, and water areas may be hazardous. Whereas the parks and recreation literature has acknowledged the link between users' perceptions and hazards in affecting safety, it has failed to consider the negative aspects of hazards using a systematic research paradigm.

One study that did incorporate perception of danger and

adjustments taken was an investigation of inner-tube safety in the southeastern Appalachian Mountains, United States (Cherokee National Forest and Great Smokey Mountains National Park). McDonald and Hammit (1982) researched inner-tube users 14 years of age and older with regard to their perceptions of certain dangers on river courses, the precautions that were taken and their attitudes toward safety management.

Using the models developed by resource geographers who study hazards, one can incorporate hazard perceptions into park safety planning. For example, studies in collective behaviour (Mitchell, 1984) could be applied to wilderness recreation where groups are involved and where they must make group decisions regarding natural hazards -- for example, deciding upon a particular route to climb. In terms of the relationship between hazard perception and distance (Mitchell, 1984), repeated visitation to one area of the park may have an impact.

2.3 Marketing Studies

The study of risk and hazard perception is an important aspect of park safety. Marketing studies involving perception are useful for building park visitor profiles. Many parks and recreation studies have dealt with the demand aspect of park safety, which is a function of activity experience, activity, desired experience and origin of users.

The user demand aspect of park safety is exemplified by attitude studies toward management; these differ from risk recreation studies which accept risk as an inherent part of recreation. For example,

Townsend and Tarbet (1982) found that river users were strongly in favour of every group carrying approved first-aid equipment, and that women were generally more safety conscious than men. Experienced users were more likely to oppose management actions which would affect their desired experiences. And they, as well as those not participating in a commercially outfitted trip, were more supportive of regulations to protect the environment than to protect the well-being of the user; freedom was very important to these people. This study helped to determine whether users share management's concerns before management implemented regulations (Townsend and Tarbet, 1982).

In another visitor study, Allen (1984) found that users of Quetico Provincial Park, Ontario, were concerned about certain management aspects with regard to safety; for example, they wanted to know how often the Ontario Ministry of Natural Resources flew planes over the park and the correct way to flag down a plane. As well, they wanted better maps and information on the location of canoeing obstacles and some place to leave their travel itineraries. Allen recommended that more safety information be added to the "Quetico Code of Wilderness Ethics."

Many studies have considered motivation for recreation. Clark's (1975) study of Algonquin Provincial Park, Ontario, emphasized that one must consider motives that prompt an individual. Thorsell (1971) considered the impact other factors had for going to three British Columbia provincial parks. To make adequate decisions, park managers need behavioural information arising from the antecedent conditions that create motivations for recreation (Driver and Tocher, 1974). The

next psychological outcome is experience which Morrison (1979) studied in Killarney Provincial Park, Ontario.

Morrison (1979) emphasized the importance of providing the experiences which the user desired. Clark (1975) in his Algonquin Park study, and Thorsell (1971) in his study of three British Columbia provincial parks were interested in the users' perceptions of both physical and social elements to see what impact this had on experience. People will exhibit preferences for different experiences (Morrison, 1979); it is important to include these resource attributes in the management objectives (Morrison, 1979; Knopp, 1972).

The amount of experience as well as the quality of experience will have an effect on management desires; different users will want varying amounts of structure in safety planning which is a function of the level of experience in the activity (Christiansen, 1977).

One must consider the satisfaction a participant receives upon fulfilling his or her desired experiences (Clark, 1975). A park manager must consider the effects that the inputs of users (numbers, characteristics, activities) have on making satisfaction in a recreation system (Clark, 1975). Park managers need to investigate the goals of the recreationists, which may or may not result in the satisfaction of needs (Driver and Tocher, 1974). In general, to fulfil the satisfactions of park users, behavioural input is necessary for knowledge concerning who prefers which recreational opportunities and experiences, when and in what amount (Morrison, 1979). Once this information has been collected, park managers can then manipulate safety management so that users are assured satisfying experiences.

Perception differences due to the origin of recreation users have also been investigated. Rural-urban perception differences, for example, have been considered by Leschot (1984), Knopp (1972) and Hendee (1969). Farm inhabitants value the opportunity for social interaction more than do urban people; urbanites and rural people with a lot of daily contact place a higher value on solitude and independence. Individuals tend to select a new recreation environment to compensate for what is lacking in their present environment. With the increased mobility of urban residents, urban users are not satisfied with one recreational setting (Knopp, 1972).

Parks and recreation marketing studies have generally fallen into two categories: 1. case studies of certain parks where all perceptions concerning physical, social and managerial attributes are examined or 2. studies in which one perceptual factor is considered in isolation from the landscape -- for example, motivation for a certain activity, or wilderness experience preferences.

In the realm of locating safety management in parks, these perception studies help to provide an information base. Because a holistic approach regarding safety must be undertaken in order to provide maximum safety with minimal user dissatisfaction, these other kinds of perception studies must be considered. The ultimate goal is to maximize safety and improve users' experiences.

Studies which consider perception of management are useful to gauge where and what kinds of safety management is suitable. The studies which concern motives, desired experiences and satisfactions can give clues as to the appropriate type and location of safety

management. If one knows what experiences people want to get out of recreation areas, then one can tailor regulations to optimize these desired experiences. The studies concerning rural-urban perceptions help clarify certain perceptual differences regarding cognizance of the environment, which may influence safety.

CHAPTER THREE

THE GARIBALDI PARK CASE STUDY

3.1 Theoretical Bases

Chapter Two has investigated the effect park users' perceptions have on their safety. We discovered in the literature that perception does play a role in the safety of users. As well, I pointed out the lack of an established research paradigm for studying hazard perception in parks and recreation literature, and the need to apply paradigms from geography.

In Chapter Three the role perception plays in park safety will be further investigated through my own case study research in Garibaldi Provincial Park, British Columbia. The paradigm used in this case study is derived in part from hazard perception research in resource geography and in part from "sense of place theory" in cultural geography. The hazard perception knowledge area will be applied to the hazard perception and hazard coping aspect of the study. The "sense of place" theory will be applied to the psychological aspects -- for example, motivation or desired experiences in the park.

Because of the many other natural and man-made hazards that have incorporated the natural hazard research paradigm successfully (White, 1974), I decided to apply a variation of it to this study of park safety planning. Since this study deals with safety in the entire natural environment of the park, all hazards were considered in the park; therefore, in a general sense it follows Hewitt and Burton's (1971) "all hazards at a place" strategy. As a geographic study, it is of interest to analyze and explain the relationships between the park

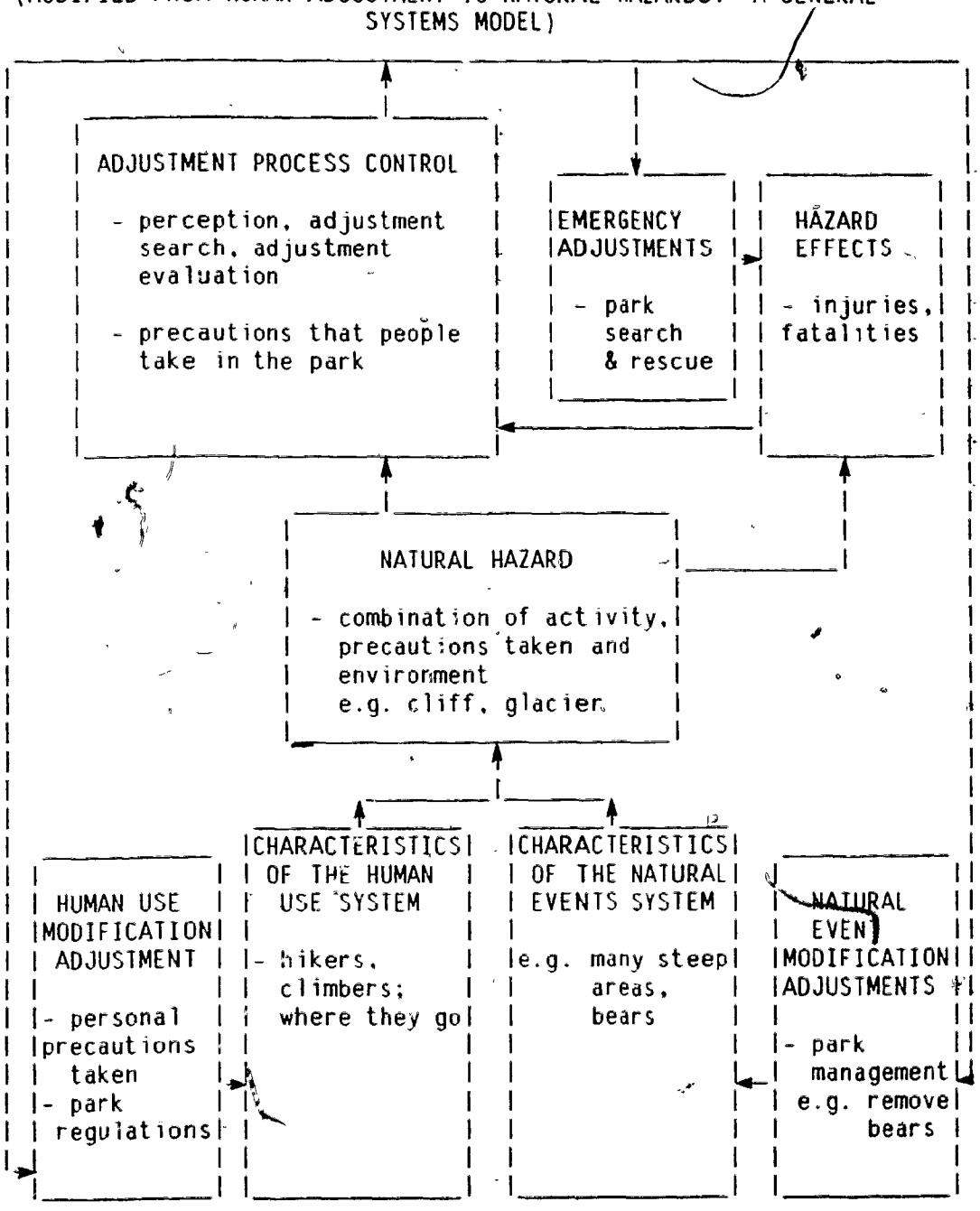
user and the hazards present in the park using geographic theory; this information could provide optimal results for ranking parks areas where there should be safety management. Thus, it was important that the proper information be obtained from the park users, which in this study was obtained primarily through questionnaires.

When designing the questionnaire, it was necessary to consider each question in terms of the hazard research paradigm (White, 1974). For the questions pertaining directly to hazards, I found that Kates' model of human adjustment to natural hazards provided a good framework. Before the development of this model, Burton and Kates (1964) discovered four general responses to the uncertainty of natural hazards; two responses eliminated the hazard and two responses eliminated the uncertainty. The responses which eliminated the hazard were 1. to deny or denigrate its existence and 2. to deny or denigrate its recurrence; those responses eliminating the uncertainty were 1. to make the uncertainty determinant and knowable and 2. to transfer the uncertainty to a higher power (Burton and Kates, 1964). These relationships helped to explain how people responded psychologically to hazards; and in many ways their psychological resolution of the problem would predispose them to particular concrete actions (adjustments). This theory initially had the floodplain resident in mind; however, the application to certain hazards in a wilderness park setting was thought to be possible by the author.

Referring to Figure 4, one can see that Kates' (1970) model consists primarily of the relationship between the human use system,

Figure 4

PERSONAL AND MANAGERIAL ADJUSTMENTS TO HAZARDS
(MODIFIED FROM HUMAN ADJUSTMENT TO NATURAL HAZARDS: A GENERAL SYSTEMS MODEL)



Adapted from: Kates (1970)

the natural events system, and the natural hazard. In a park these three components can be translated into the park user and his or her behaviour (human use system), the natural environment of the park (natural events system) and those dangerous areas of the park (natural hazards). In the wilderness park context, an adjustment refers to the decision to take precautions in the park. For example, a personal precaution can be a first-aid kit.

Park management can also be described using Kates' (1970) model. The emergency adjustments could involve park search and rescue. As a result of these emergency adjustments in combination with the hazard effects -- for example, injuries -- certain park managerial adjustments may occur to the natural environment -- for example, removing bears (natural event modification adjustment) -- and to the human environment -- for example, regulations (human use modification adjustments).

Clearly, other factors such as experience can have an impact on Kates' (1970) model. It was learned that in the case of flooding, there existed a threshold value for flood frequency which prompted adjustments to be taken (Burton et al. 1968); the frequency of exposure to hazards in parks could probably also have an impact on adjustments taken. Furthermore, Kates (1962) stated that education may change perceptions; changes in perceptions toward park hazards could have an impact on the adjustment process which in the long term could alter the characteristics of the human use system.

In summary, there is a need for the integration of the concepts developed by resource geographers into park safety planning for organizational purposes. Many of the theories developed by Kates and

other geographers can be applied to park hazards. The models these resource geographers have developed help to standardize study results -- it is much easier to compare studies when they use the same terms of reference. Furthermore, more qualitative or humanistic environmental perceptions could play a part in the realm of studying safety; they could help to balance and compensate the plethora of positivistic (empirical) studies which have dominated this research area. Clearly, a research paradigm must be developed before solving practical safety problems.

Perception of place can also be used for safety planning. Why one decides to go to a certain area in a park can imply where people generally go, especially if they possess the same motivation factors. These motivational factors can then be correlated against social characteristics. For example, the type of environment one was brought up in may have a profound impact on ones's relation to the wilderness; any physical responses in the wilderness will certainly be predisposed by one's relation with it. Each decision regarding the location of safety management must consider how people presently relate to each region of the park and how they want that relationship to develop in the future -- the goal is to optimize the users' experiences in the park.

The decision to change the human use component of a park is derived from the analysis of questionnaire responses. Those questions may not have to deal explicitly with safety; they can also be implied. For example, one could ask a park user for his or her motivation to go to the park -- what the park means to them. If the response is

risk-taking, then perhaps one should investigate further the safety features of the park. The feelings for and understanding of the park environment is probably the closest way of predetermining park user behaviour, short of actually observing someone. Simply asking people whether something should be done does not create a good picture of the different users in the park. Clearly, asking how people feel about things or what they know about them is not going to produce as high a quality behavioural data base as observations of people will; however, to observe the same number of people in a park would be far too expensive and would probably impinge on people's privacy.

People may like certain wilderness recreation areas for different reasons. It is true that most people who ordinarily go to wilderness recreation areas have a close relationship to that area; however, relationships will vary. For example, an interview with six people in Alberta who differed socio-economically but had a close relationship with the wilderness, were all asked to describe what wilderness means to them (Alberta Environment, 1986). Of interest was how their meaning of wilderness was inter-related with their desires for management. For example, a female outdoor writer and an active outdoor enthusiast said, "It's so important for me to see a landscape that hasn't been affected by man -- hasn't been planned; trimmed, laid out" (Alberta Environment, 1986, p.4). On the other hand, a handicapped male who had recently become affected by a regulation banning four-wheel drive vehicles from logging roads on the east slopes of the Alberta Rockies stated, "Lots of people with legs missing can't go into the backcountry anymore. What the government is doing is locking out people like me who have a

handicap" (Alberta Environment, 1986, p.5). Clearly, how people interpret their wilderness surroundings has an impact on what they want that recreational wilderness land to become.

In cultural geography, this concept of what areas mean to different people is commonly known as "sense of place." While this concept is generally used in an academic framework to understand why people go to certain places or why they choose to remain in other ones, it can also be applied to practical problems.

An example of applying the "sense of place" concept is neighbourhood planning of St. Paul, Minnesota (Lanegran, 1986). In his paper, Lanegran (1986) described several examples of where "sense of place" in the historical cultural sense was incorporated into resolving regional planning problems. By promoting a positive "sense of place," the socio-economic health of many regions increased; undesirable businesses were replaced and housing was improved, all through consensus decision-making of what present images the residents had of the area and what they wanted to see it become in the future. Throughout these planning problems, cartography, visual thinking and interviewing were the methodological tools. Lanegran (1986) used the concept of mental maps inasmuch as he tried to market new buildings by having people etch them into their mental maps of the city.

Applications of these natural hazard and "sense of place" paradigms can be applied to park safety planning with minor changes. First, by using the concept of recreation geography instead of historical cultural geography, one can determine the feelings or "sense of place" that the person has for the park. Second, asking what

motivates people to come to and recreate in the park can give an indication of the recreation value for the park; these motivations can also vary spatially within the park. Third, by asking people what kinds of safety management they would like to see in the future, one can then spatially locate safety management as best as possible to preserve their "sense of place." Clearly, as indicated in the previous examples from Alberta, the "sense of place" of a wilderness area can vary drastically; and the impact of these variations will cause problems in management -- including safety. Using "sense of place" concepts in addition to hazard perception knowledge, one is better able to come to grips with where the dangerous misperceptions lie, and what measures can be taken to mitigate them while trying to preserve a positive "sense of place" in the respective areas of the wilderness park.

3.2 Methodology

The Garibaldi Park case study used a questionnaire as the principal source of data. Informal interviews with park staff were also used as a supplement. The following section will describe the steps from designing to analyzing the questionnaire.

In developing a questionnaire useful for providing information which could lead to preventing accidents, many things had to be taken into consideration. First, a theoretical framework to tie together the questions -- and potential answers -- had to be developed. This was a difficult task initially since the problem of safety in parks was an interdisciplinary one which involved literature from parks and

recreation, forestry, planning and geography. First-hand attempts at writing a questionnaire did not take this theoretical component into consideration and therefore there was a lot of aimless wandering.

Another issue which had to be dealt with was the philosophical approach. In other words, was a structured or a more free-form open-ended questionnaire desired? The choice depended upon the advancement of this area of research. If enough questionnaire results from other studies could have been amassed, then it would have been possible to formulate a structured questionnaire. However, this is a recent area of research -- not much work has been done in the area of park safety perceptions. Harvey (1969) points out that in such cases a more open, exploratory study is appropriate; Priddle (Personal Communication, May 1986) reiterated this approach. Priddle said that a more structured approach could be used after the results from such an exploratory questionnaire were collected.

In devising the questionnaire, the problem of length also had to be considered; an exploratory questionnaire is invariably lengthy. A balance had to be obtained between what was realistic in terms of user response and useful information. Many questionnaires taken from other theses were examined. Most of them tended to be about five pages long. Their sample sizes were very small (around 200). A point to keep in mind though is that in these studies, prospective questionnaire respondents were found only in small numbers each day (e.g. Allen, 1984; Clark, 1975); thus, these people would probably be more sympathetic to a longer questionnaire. Secondly, these studies tended to disturb people only while they were stationary -- for example, when

setting up camp. In any event, because the park visitation rates for Garibaldi Park were deemed higher than those of these other studies, a much shorter questionnaire was chosen.

A pragmatic geographic approach as described by Frazier (1981) was chosen; therefore, the questionnaire consisted both of positivistic and humanistic elements. The questions were structured two ways: with a yes/no format and a five point Likert scale, which assured a good response rate due to ease of answering. Many of these questions also had an "other" category where those who wished could express themselves better than by just ticking off a number. The structured positivistic design was also intended to help generate new thoughts for the respondents, which could be expressed freely in the "other" categories.

Questionnaire Explanation

The questionnaire (Appendix 1.1) was broken down into six themes using Kates' (1970) "Human Adjustment to Natural Hazards: A General Systems Model" as a conceptual framework (Figure 4). The order in which the questions were asked does not directly follow this theme; question response sensitivity and difficulty also had to be considered so that the question order appeared logical to the respondents as well as to the interviewer.

The first questionnaire theme involved the characteristics of the of the trip (questions 1, 3, 4, 6, 7, 14, 20, 21, 22, 23, 24 and 25). This corresponds to the "characteristics of the human use system" component in Kates' model. These questions dealt with activity, the park users behaviour and socio-economic characteristics.

The second questionnaire theme dealt with hazard perception,

related to the "adjustment process control" component in Kates' model (questions #9, #10, #11 and #19). Question #9 tested people's cognizance of accident types and causes; such perceptions could predispose their susceptibility to accidents. Question #10 responses, when compared between different areas, can indicate the areal variations of concern for hazards and why these variations may exist. Question #11 responses give a medium for comparing perceived risk between respondents in different settings and/or activities. Question #19 responses give an indication of where people perceive hazards and why they perceive those areas to be hazardous; responses can be compared according to setting, activity and experience.

The third questionnaire theme dealt with experience in activity and setting, which in the short-term is related to the "hazard effects," component, but in the long-term is related to the "characteristics of the human use system" component. Questions #2 and #13 deal with experience in activity; specifically, question #13 is related to the "hazard effects" component in Kates' model. Question #5 and #15 probe to different degrees experience in the Garibaldi Park setting.

The fourth questionnaire theme is the awareness of managerial adjustments (question #16), which relates to "adjustment process control" where adjustments are searched for and then evaluated. There may be a relationship between perception of managerial adjustments and vulnerability to hazards (or perceived vulnerability) or access to information (Kates, 1970), which may be a function of experience in the park. It is also of interest to find out the level of awareness of

safety facilities, services and regulations so that if needed, awareness can be increased.

The fifth questionnaire theme is personal adjustments taken, which is related to the "human use modification adjustments" component in Kates' model. These adjustments can be broken down into long-term precautions (question #8) and short-term precautions (question #12). The adoption of the two types of adjustments are related to Kates' "adjustment process control;" this control is affected by human as well as natural hazards, and hazard effects -- for example, experiencing an accident.

The sixth questionnaire theme -- attitudes toward possible managerial adjustments (questions #17 and #18) -- is accommodated in the "adjustment process control" where adjustments are evaluated. Although wilderness parks may have hazardous areas, it is not an objective to remove everyone from the park; the fulfilment of users' desired experiences is very important to park managers. Therefore, one must consider the users' attitudes toward safety. Question #18 was asked on behalf of the Garibaldi Park staff and is not discussed in the results section.

Sample Design

A total of 512 questionnaires were given out at five park entrances. There were 37 handed out at Wedgemount Lake, 64 at Fitzsimmons, 82 at Cheakamus Lake, 236 at Black Tusk and 93 at Diamond Head. Each entrance generally serves only one distinct area of the park. However, the Black Tusk and Cheakamus Lake entrances can serve

parts of the same area (Figure 5).

Only summer visitors to Garibaldi Park were sampled since this study was limited to summer users, activities, and the associated hazards and risks. Every user over 10 years of age was asked to take a questionnaire as they were leaving the park. Those people who took only one questionnaire per group were asked to fill it out individually -- group perceptions were not a concern.

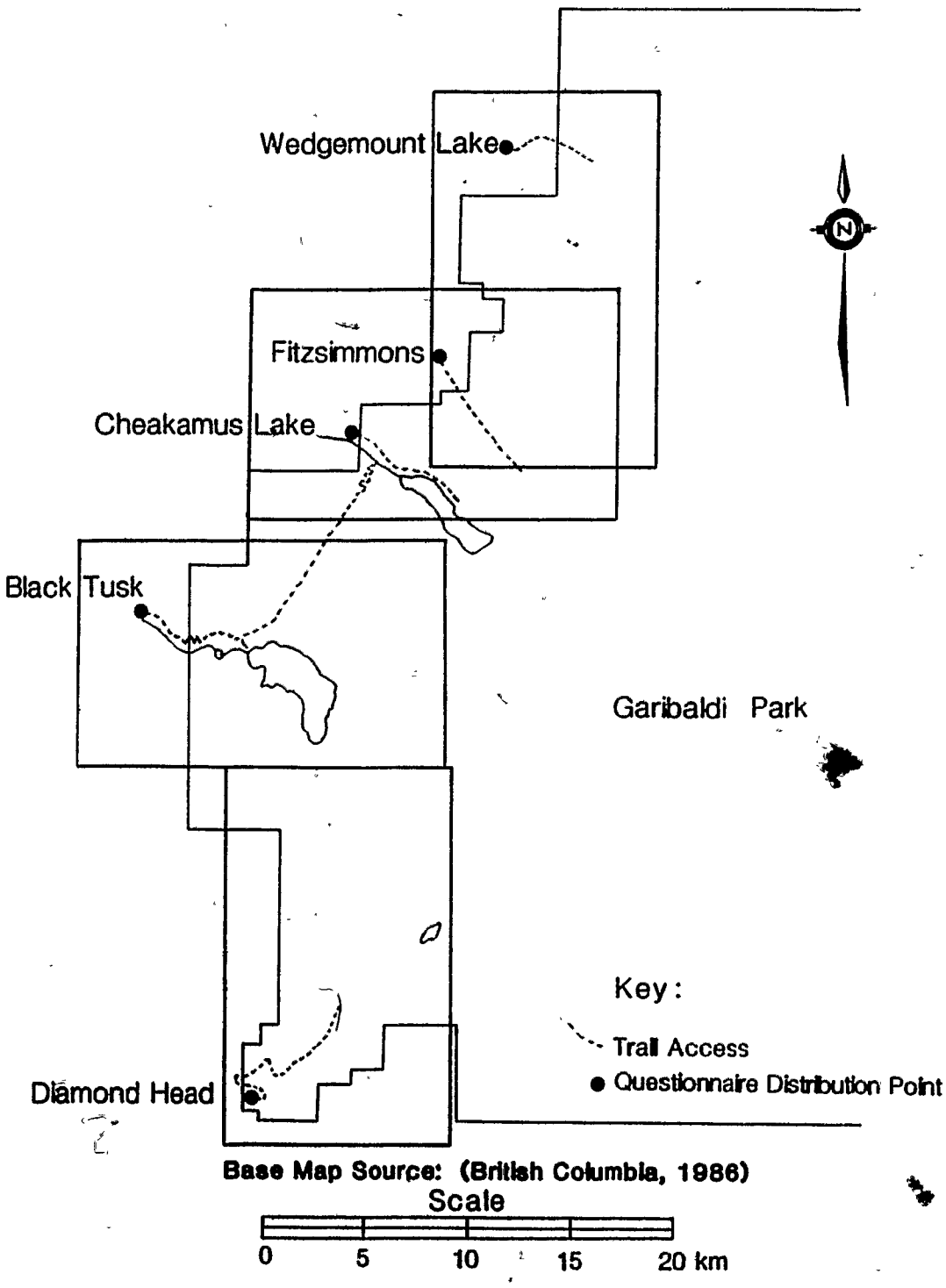
The sample time frame was from Saturday August 2, 1986, to Sunday August 17, 1986; a 15 day span; there was no sampling on August 11, 12, 14 and 16. Questionnaires were handed out at Wedgemount Lake on August 5, 9, 10, 17; Fitzsimmons, August 2, 17; Cheakamus Lake, August 3, 9; Black Tusk, August 5-9, 13; and Diamond Head, August 4, 13, 15.

The weather generally remained constant: 25 - 30 degrees Celcius with less than 25 percent cloud cover. An exception occurred on Sunday August 10, when there was about 75 percent cloud cover. On Monday August 11, and Tuesday August 12, the sky was overcast; no surveying took place on these dates; however, the Wednesday August 13 responses may have been affected by respondents who had been in Garibaldi Park during the cloudy period.

It was decided that the weather variable was more important than randomly assigning trailhead entrances to different days. Garibaldi Park staff had noticed significant differences in the quality of responses when questionnaires had been given out in foul weather as opposed to good weather (Lang, Personal Communication, August 1986). With the persistence of good weather, it was decided to hand out as

Figure 5.

Questionnaire Distribution Points and Relative Location of Topographic Maps Used in the Questionnaire



many questionnaires as quickly as possible. Therefore, during the mid-week following the August 2 weekend, sampling occurred continuously at Black Tusk where the mid-week response rate was much higher than at any of the other trailheads.

Park visitation statistics from June to September for 1983, 1984 and 1985 were used to calculate the average visitation for each park area (day and night statistics were combined) (Appendix 1.2). The park areas were then sampled proportionally to the amount of visitation.

Problems with the sampling process were as follows. There were no user statistics for Wedgemount Lake so only an estimate could be used, determined by analyzing the number of cars, people who registered and people initially interviewed, in relation to the four other trailhead entrances. Only statistics for 1985 were obtainable for the Fitzsimmons entrance, while comparable statistics from the other three entrances, Cheakamus Lake, Black Tusk and Diamond Head, were averaged from 1983, 1984 and 1985. Since some park entrances were sampled on week days instead of weekends, there may have been some variation in response quality. Some park users could not speak or read English, therefore this group be may have been under-represented.

Questionnaire Response Classification Problems

The close-ended questions were assigned response categories based on open-ended responses given while pre-testing the questionnaire. The responses to open-ended questions, however, had to be categorized for classification using the criteria presented in Appendix 1.3.

Close-ended questions involving subjective issues were difficult to create response categories for. Question #6 (main motivation) was the most difficult to categorize; most people had more than one main motivation and/or had a main motivation which was not listed in the response categories. The following list describes some of the problems which occurred while categorizing the open-ended questionnaire responses.

1. Occupation categorization: The Canada Census classification system was used for occupation categorization; certain professionals were difficult to classify -- for example, do architects fall under "natural science" or "social science"?

2. The presence of bias: for most questions, the first response was recorded, which may lead to bias since multiple responses may be inter-related (Allen, 1984).

3. Dissimilar criteria: after entering the data, it was realized that similar responses were classified under different categories -- for example, some electricians may have been classified both as "fabricators, assemblers" and "construction workers."

4. Breadth of categories: some of the categories are broader than others -- for example, people who went to "Black Tusk base, Helm Lake and Taylor Meadows," or "falls" and "falls with minor injuries."

5. Degree of destination generalization: it was a problem as to what degree destinations should be generalized. It was difficult generalizing where people went by assigning a number -- too many possible routes.

6. Difficulty of giving a generalized response: in question #9, some questionnaire respondents had difficulty trying to generalize the most common type of safety accident or mishap and the most common cause of safety accidents or mishaps -- often multiple responses were given.

7. Subjectivity: this was a problem in designing value labels for each variable in order to use the SPSSX statistical package; and responses had to be subjectively eliminated -- for example, in question #16, those facilities, services and regulations which had nothing directly to do with safety.

3.3 Interpretation Of Questionnaire Results

The following section of Chapter Three is an analysis of questionnaire results, which will be compared between the five survey areas, then summarized for the entire park. Results will be discussed under the headings given earlier in the chapter when explaining the questionnaire. The results form a case study of Garibaldi Park; they cannot be tested statistically using Chi square due to the small sample size for each area and the high proportion of expected values less than five in the contingency tables. However, other studies in geographical hazard research will be referred to where parallels can be drawn.

Characteristics of the Trip

Characteristics of the human use system are an integral part of Kates' (1970) model of human adjustment to natural hazards (Figure 4). These characteristics consist of general socio-economic factors, what people were doing in Garibaldi Park, the group size, motivations, etc. The objective is to develop visitor activity profiles so that the most accident prone user can be isolated in each Garibaldi Park area; this will be discussed in detail later in Chapter Three. One must first determine which activity groups are using the park, their relative size, where they are going in the park and their general behavioural make up.

The socio-economic background of a person has been found to have an impact on hazard perception and adjustments taken. In flood perception, Kates (1970) found that personality factors, social environment and the nature of the experience affects perception. Saarinen (1982) has found similar results for hazards in general.

An objective in this study is to determine whether there was any relationship between socio-economic variables and perceptions and/or adjustments taken.

First, in all Garibaldi Park areas, the majority of visitors lived in Greater Vancouver (Appendix 1.4). The smallest majority from Greater Vancouver occurred in the Black Tusk area. Therefore, there are probably more people from distant destinations who go to the Black Tusk area. Their awareness of seasonal hazards may be affected by the distance that they live from the park and living in an urban environment. In other studies, variations in perception have been

noticed between urban and rural recreationists (e.g. Bammel, 1982). Moreover, where one is brought up may affect safety perceptions and preparedness. In all five park areas, the majority of users were brought up in cities (Table 1). However, in the Wedgemount Lake area, there was a much higher percentage of people who were brought up in cities than in the other four park areas.

Second, there was no major variation in the dominant occupational classes between the five park areas; they consisted mostly of professionals: managers, engineers, medical personnel, teachers and students (Appendix 1.5). In floodplain studies, Burton et al. (1968) found differences between professionals' (i.e. civil engineers) and non-professionals' perceptions.

Third, there was no major difference between the five areas in terms of education; most people were found to possess at least a university degree and/or a professional/graduate degree except in the Wedgemount Lake area, where most people had at least some university or a university degree (Appendix 1.6). Kates (1970) found that education may affect how people adjust to hazards.

With regard to learning about safety, responses indicate that the most dominant source of information in all areas was "books" (Appendix 1.7). The second most dominant source varied; at Fitzsimmons and Diamond Head it was "friends/others;" at Black Tusk it was "experience;" at Wedgemount Lake it was "reading;" and at Cheakamus Lake it was a combination of "park pamphlets/information," "friends/others," and "none" (no main source). Wedgemount Lake users relied the most on theoretical sources (literature); however, they also

TABLE 1

WHERE GARIBALDI PARK RESPONDENTS WERE MOSTLY BROUGHT UP

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
City	81.0	60.5	51.7	52.0	55.3
Town	19.0	27.9	24.1	33.3	29.8
Rural area	---	11.6	24.1	14.6	14.9
	N=21	N=43	N=29	N=123	N=47

relied more on "organizations/clubs" than users in the other areas. The lowest percentage of people who relied on "friends/others" and "experience" and who had no main source of wilderness safety information, was in the Cheakamus Lake area. Perhaps, this trend is an indication of lack of experience in activity and lack of concern for safety preparedness in the Cheakamus Lake area. Clearly, how and where one learns about wilderness safety will affect their environmental perceptions, especially in terms of precautions taken.

Fourth, most people fell within the 31-50 year age range; however, in the Cheakamus Lake area, the park users tended to be a little older than in the other four areas. There were very few people under 30 in any of the park areas (Table 2). The majority of respondents were male except at Fitzsimmons (Appendix 1.8); this may be due to chance.

In general, Garibaldi Park respondents were from Greater Vancouver and were brought up in a city environment. The largest occupational class consisted of professionals. The respondents were generally well educated, possessing in most cases a university degree. Park users learned most of their safety from theoretical sources (mostly books), followed by informal sources (friends/others, experience), formalized sources (courses/clubs), and lastly park services. Most of the people fell in the age range from 31 to 50 and were male. Twelve to fifteen years earlier, Thorsell (1971) and the British Columbia Parks Branch (September 1975) found similar socio-economic characteristics -- the subsequent years have not brought significant changes. The Black Tusk area would receive top safety priority due to the highest proportion of visitors coming from distant destinations beyond Greater Vancouver.

TABLE 2

AGE OF GARIBALDI PARK RESPONDENTS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
10 - 20	---	---	3.4	---	---
21 - 30	4.3	2.4	3.4	8.1	---
31 - 40	43.5	31.0	31.0	40.3	29.8
41 - 50	39.1	38.1	24.1	25.8	40.4
51 - 60	13.0	16.7	24.1	16.1	21.3
61 - 70	---	11.9	13.8	6.5	6.4
71+	---	---	---	3.2	2.1
	N=23	N=42	N=29	N=124	N=47

The characteristics of the trip to Garibaldi Park did not vary much in terms of activity; most people who visited the various areas of the park were hikers. There was a strong representation of mountaineers at the Wedgemount Lake area; the Cheakamus Lake area catered to a handful of canoeists and fishermen; and there were a few swimmers and people fishing at Garibaldi Lake (Table 3).

There were, however, variations in the duration of trip taken and the area in which it was taken. Most people went to Garibaldi Park for one day except in the Wedgemount Lake area where the largest minority of respondents went for two days (Table 4); these longer trips are probably due to the extensive climbing opportunities in the area. At the Cheakamus Lake and Diamond Head areas, there was a large proportion of users who went only for one half day -- Cheakamus Lake in the Cheakamus Lake area and Red Heather Meadows in the Diamond Head area, are not far from the park entrances. Not as many precautions, therefore, can be expected to have been taken as, for example, with people who went to the park for two days; this trend with regard to short-term precautions was apparent after subsequent data crosstabulations.

The most common destinations in the five areas were Wedgemount Lake, Singing Pass, Cheakamus Lake, Garibaldi Lake and the surrounding meadows, and Elfin Lakes (Appendix 1.9). However, a large proportion of people climbed Mt. Wedge, ascended Black Tusk or went up the Gargoyles -- all objectively hazardous areas.

The most common main motivation response was the "other" category; this exemplifies the difficulty trying to persuade people to respond

TABLE 3

PRIMARY ACTIVITY UNDERTAKEN BY GARIBALDI PARK USERS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Hiking	50.0	97.7	71.4	86.4	93.9
Mountain-eering	41.7	2.3	---	---	4.1
Climbing	---	---	---	3.2*	---
Camping	4.2	---	7.1	0.8	---
Fishing	---	---	7.1	1.6*	2.0**
Canoeing	---	---	3.6	---	---
Swimming	---	---	---	4.0*	---
Sightseeing	4.2*	---	7.1*	1.6*	---
Photography	---	---	---	0.8*	---
Sketching	---	---	---	0.8	---
Recuperation	---	---	---	0.8	---
Family reunion	---	---	3.6	---	---
	N=24	N=43	N=28	N=125	N=49

* may also have included hiking as a response

TABLE 4

DURATION OF TRIP TO GARIBALDI PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Less than 1 hour	---	---	---	0.8	---
Half day	4.2	16.3	42.9	12.0	30.6
1 day	16.7	60.5	21.4	52.8	32.7
2 days	58.3	14.0	21.4	23.2	14.3
More than 2 days	20.8	9.3	14.3	11.2	22.4
	N=24	N=43	N=28	N=125	N=49

with only one main motivation. The motivations "exercise" and "relaxation" were also common responses. An "exercise" motivation was more common in the steeper areas -- for example, Wedgemount Lake -- whereas "relaxation" was a more common response along the easier trail access -- for example, Fitzsimmons or Cheakamus Lake. "Challenge and risk" was the main motivation of some people in the Wedgemount Lake and Black Tusk areas (Table 5). In the Wedgemount Lake area this motivation corresponds with the high proportion of mountaineers; in the Black Tusk area, it corresponds with the hikers and climbers who ascended Black Tusk. Other things being equal, if safety management were increased in the Wedgemount Lake or Black Tusk areas, some visitors would likely be displaced, resulting from their inability to experience challenge and risk.

Finally, many variations in group size occurred (Table 6). The greatest proportion of large groups occurred in the Cheakamus Lake area. The largest proportion of soloists occurred in the Wedgemount Lake and Black Tusk areas. Solo travel behaviour has safety planning implications due to the presence of many objective hazards where there is low user density; if an accident occurs no one can summon help or assist the victim.

In conclusion, most people that came to Garibaldi Park during the survey period were hikers and came for one or two days. The most popular place was the Garibaldi Lake area. Very few people were in the park due to a motivation of "challenge and risk." Most people travelled in groups of two. In terms of safety management, Black Tusk and Wedgemount Lake should be targeted since at both areas there were

TABLE 5

MAIN MOTIVATION FOR COMING TO GARIBALDI PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Exercise	25.0	20.9	20.7	16.8	20.4
Challenge & risk	20.8	---	---	2.4	---
Escape	4.2	4.7	3.4	9.6	8.2
Solitude	8.3	2.3	6.9	0.8	---
Spiritual rejuvenation	---	9.3	6.9	9.6	16.3
Relaxation	8.3	30.2	31.0	17.6	20.4
Socialization	---	---	13.8	5.6	---
Education	---	---	---	0.8	---
Other	33.3	32.6	17.2	36.8	34.7
	N=24	N=43	N=29	N=125	N=49

TABLE 6

SIZE OF GROUP IN WHICH GARIBALDI PARK RESPONDENT WAS TRAVELLING

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Solo	12.5	7.0	---	10.4	6.1
Two	20.8	44.2	27.6	44.8	63.3
Three	16.7	32.6	3.4	16.8	14.3
Four	29.2	2.3	31.0	9.6	8.2
Five or more	20.8	14.0	37.9	18.4	8.2
	N=24	N=43	N=29	N=125	N=49

many soloists, mountaineers or climbers; visitors went for a longer duration at Wedgemount Lake; and the user density was the highest in the Black Tusk area. On the other hand, Black Tusk and Wedgemount Lake had people desiring "challenge and risk;" some people would not favour increased safety management.

Hazard Perception

The goal of the following hazard perception analysis is to determine where and why people perceive certain areas to be hazardous. The main objective is to try to associate perceptions with where objective and subjective hazards occur, first with large scale areas -- for example, Diamond Head -- and then regions within those areas. Some hazards can be difficult to locate -- for example, bears, incompetence, poor clothing; where people perceive them can help locate the hazards. Other interests are to determine the causal factors of hazard perception, if these factors are applicable to users in other parks, and if safety planning can be developed to incorporate these perception factors.

In other studies hazard perception has differed amongst people due to hazard frequency and intensity, which are inter-related (Saarinen, 1982; Burton et al., 1968; White, 1964). In the Garibaldi Park study some people may have come into contact with more hazards due to the activity or destination chosen; or they may have come into contact with an intense (severe) hazard such as being trapped in a crevasse.

In the five areas of Garibaldi Park, the most common response was "some" concern, for at least two hazards (Appendix 1.10). In the

Wedgemount Lake area most people had "no" to "moderate" concern for steep areas; and the majority had "no" to "some" concern for rough trail surfaces, exposure, sunburn, foul weather and exhaustion, and most users had no concern for the other hazards listed (bears, becoming lost). In the Fitzsimmons area most people had "no" to "some" concern for all the hazards listed except steep areas and becoming lost, for which most people had "no" concern, and sunburn for which most people had "no" to "moderate" concern. In the Cheakamus Lake area most people had "no" to "some" concern for all the hazards listed except becoming lost, for which most people had "no" concern. In the Black Tusk area most people had "no" to "some" concern for all the hazards except bears, foul weather and becoming lost, for which they had "no" concern. In the Diamond Head area most people had "no" to "some" concern for all hazards except exposure, bears, becoming lost and exhaustion for which they had "no" concern. In the Wedgemount Lake area most people had either "no" or "one" additional safety concern; in the other areas, most people had no additional safety concerns.

The minimal concern for the above hazards may reflect the findings of Burton and Kates (1964): often people "cope" with hazards by denying that they occur.

In terms of an overall danger rating for the areas of Garibaldi Park, Wedgemount Lake respondents expressed much more perceived danger in the trip that they took than respondents in the other four areas (Table 7). Thorsell (1971) found similar danger perception results. In both 1970-71 and 1986, most park users had only been to Garibaldi Park about five times, were not really aware of their natural

TABLE 7

AMOUNT OF DANGER PERCEIVED IF NOT PROPERLY PREPARED ON THE TRIP THAT WAS TAKEN

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
None	4.3	2.4	3.4	9.8	8.2
Some	21.7	47.6	79.3	46.7	63.3
Moderate amount	17.4	28.6	13.8	30.3	20.4
Large amount	13.0	11.9	3.4	11.5	4.1
Extreme amount	43.5	9.5	---	1.6	4.1
	N=23	N=42	N=29	N=122	N=49

surroundings and did not think that there was a lot of danger in the park.

The most commonly perceived safety accidents or mishaps were not serious in nature. "Twisted ankles" was the most common response except in the Diamond Head areas where "falls" was the most common response, and in the Wedgemount Lake area where "lost" was the most common response (Appendix 1.11). The presence of the Gargoyles and Mt. Atwell in the Diamond Head area may have influenced people to record "falls" as the most common safety mishap type. Navigation may have been a concern with Wedgemount Lake area users for them to indicate "lost" as the most common safety accident. In the other three areas, trail conditions were probably of concern since "twisted ankles" was the most predominant response.

The most commonly perceived safety accident or mishap causes were human derived, not results of nature. "Carelessness" and "improper preparation" were the most common responses in all areas except in the Wedgemount Lake area where "inexperience" was the most common response. In the Diamond Head area, in addition to "carelessness" and "improper preparation," "exhaustion" was also given as a response in the same proportion (Appendix 1.12).

Thus, subjective hazards are perceived to be more important in causing accidents or mishaps than objective hazards. Simpson-Housley (1979) and Wong (1979) characterized people who felt that they could avoid hazards as having an internal locus of control. Those people with an external locus of control believe that the causes of accidents or disasters are a sole result of the natural environment.

Hazard Perception Mapping In The Five Park Areas

Hazard perception maps were obtained for the five park areas: Diamond Head, Black Tusk, Cheakamus Lake, Fitzsimmons and Wedgemount Lake. Respondents were asked to circle areas which they felt were most hazardous, then explain in a couple of words why they considered those areas to be hazardous. Each outlined hazardous area represents a combination of subjective and objective elements which together cause the respondent to evaluate the particular area(s) as most hazardous. Questions that the planner must ask are 1. Are these outlined areas indeed hazardous? if so, for whom? 2. Why are these areas hazardous? What are the factors? 3. What should be done about these hazardous areas?

The reasons respondents gave for circling areas as hazardous were categorized using the following criteria:

1) topography and/or geology, e.g. steep, loose rocks, glaciers, avalanches
2) human, e.g. park visitors, their actions, or where explicitly stated park management such as trails
3) weather and/or climate, e.g. whiteouts
4) water bodies, e.g. fast flowing river water
5) other, e.g. human and topography or other combinations, or completely different responses
6) no response

The following section analyzes qualitatively the results for each of the five sampling areas.

WEDGEMOUNT LAKE (Figures 6 & 7)

Most people perceived the glacier areas as hazardous especially

figure 6

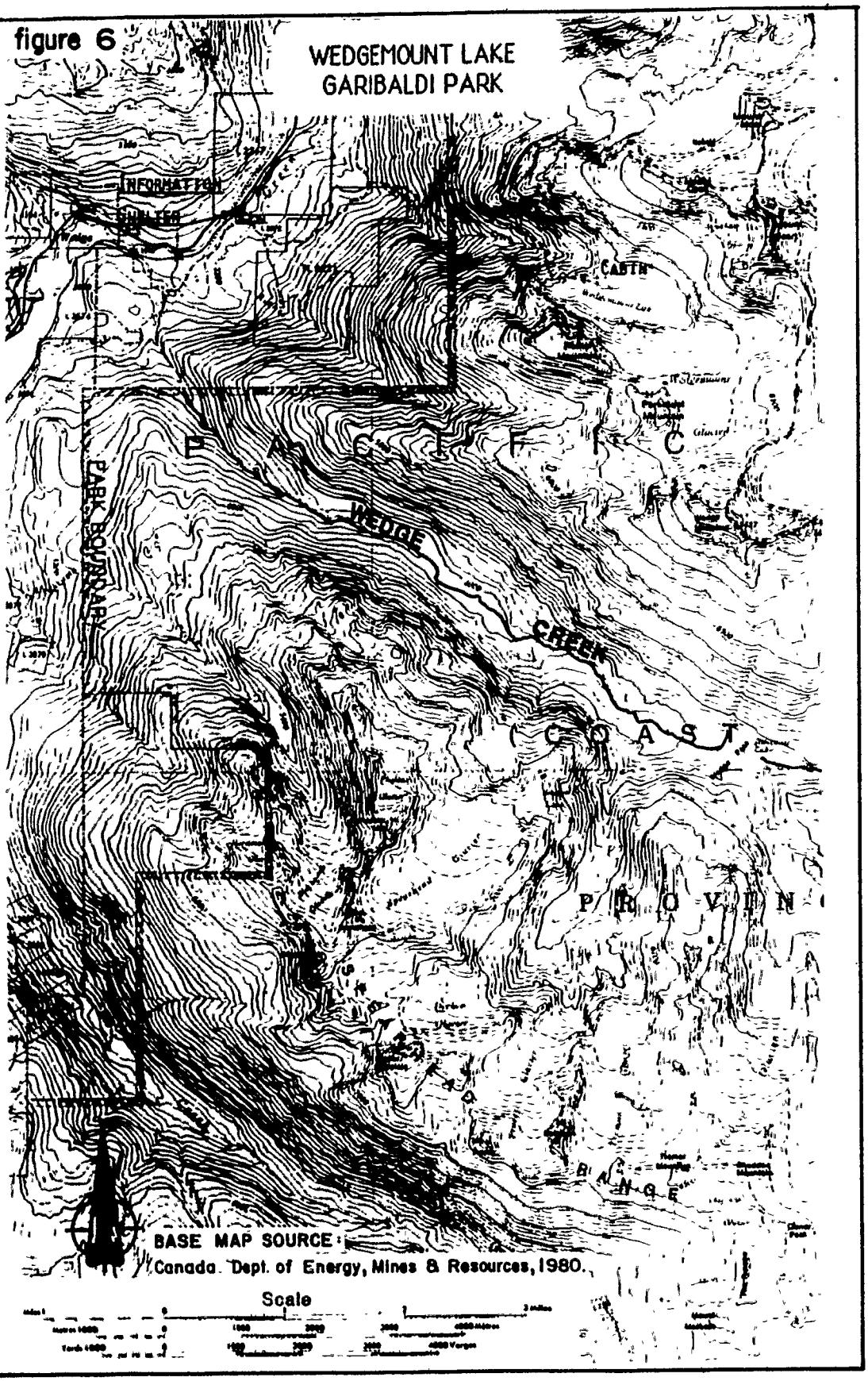
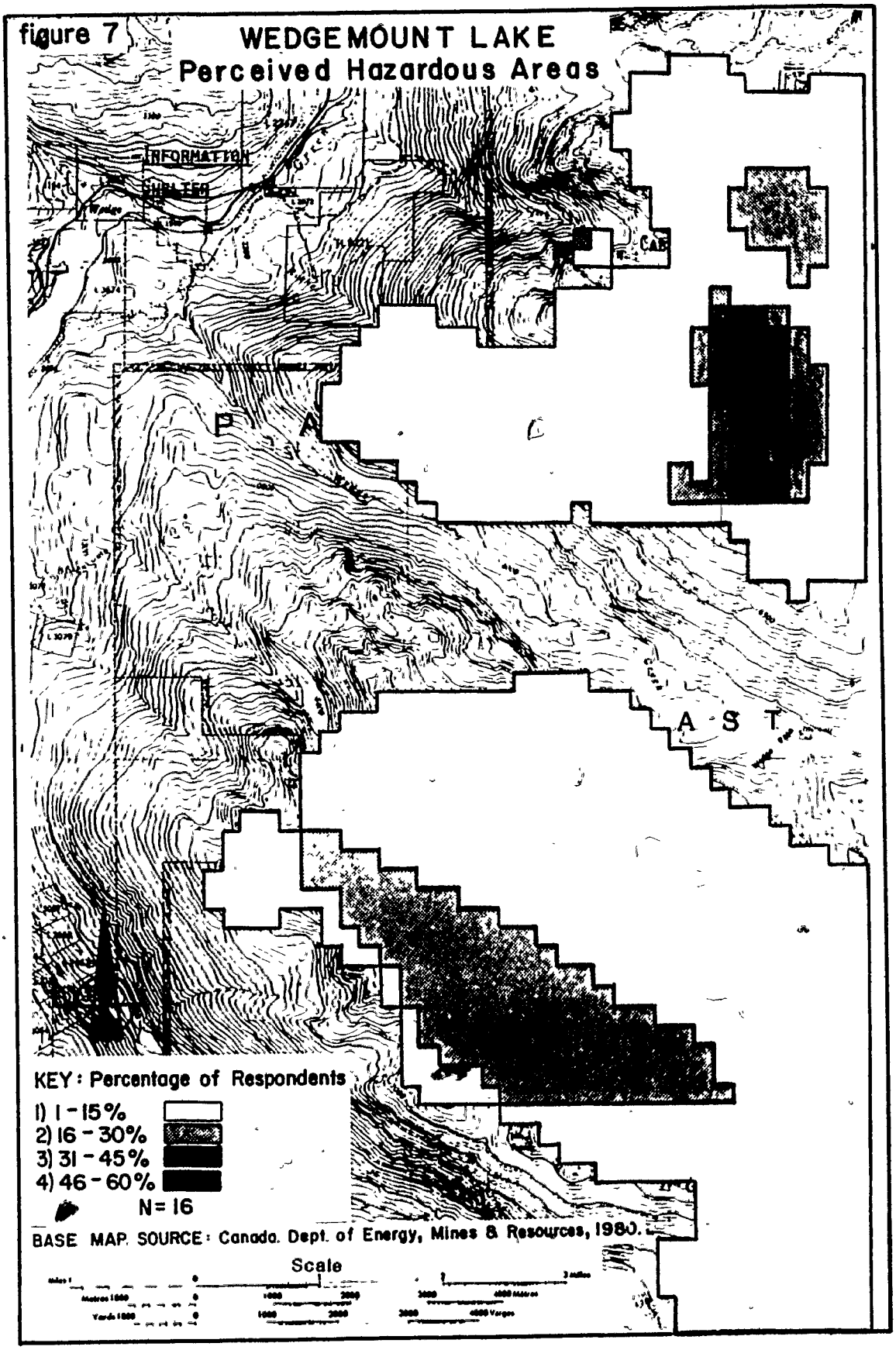

WEDGEMOUNT LAKE
GARIBALDI PARK
INFORMATION
CASTH
PACIFIC
WEDGE
CREEK
PARK BOUNDARY
COAST
PROVINCIAL
RANGE
BASE MAP SOURCE:
Canada. Dept. of Energy, Mines & Resources, 1980.
Scale

figure 7


WEDGE MOUNT LAKE
Perceived Hazardous Areas
INFORMATION
KEY: Percentage of Respondents
1) 1 - 15%
2) 16 - 30%
3) 31 - 45%
4) 46 - 60%
N = 16
BASE MAP SOURCE: Canada. Dept. of Energy, Mines & Resources, 1980.
Scale

those locations which were common destinations. Some users chose the Spearhead Range (which also has many glaciers). It is unlikely that they would have reached these mountains from the Wedgemount Lake area; thus, they only experienced them visually either in the park or on the map. The experience element of hazard perception is evident in the high response areas, where visitors often travelled. For example, many users chose the glacier on the way to the summit of Wedge Mountain. Some users were precise in their location of hazardous areas -- for example, the hill before the cabin is reached at Wedgemount Lake. Such information would be useful for park managers who are interested in site planning for safety.

The reasons people gave for areas being hazardous were mostly objective, relating to topography and/or geology (Appendix-1.13). "Glaciers," "crevasses," "steep" areas and "loose footing" were common responses. Subjective responses such as people venturing onto glaciers or visitors causing rocks to fall on top of other visitors were not common.

FITZSIMMONS (Figures 8 & 9)

In the Fitzsimmons area, most people circled Overlord Glacier and environs, probably due to the Russet Lake cabin from where people can gain easy access to the glacier or experience it visually. There were only nine responses along the trail leading into Singing Pass. These responses would be the most useful for park managers since they pertain directly to site planning issues -- trail safety. Most people were concerned about areas they could see but did not go to; that is, the

figure 8

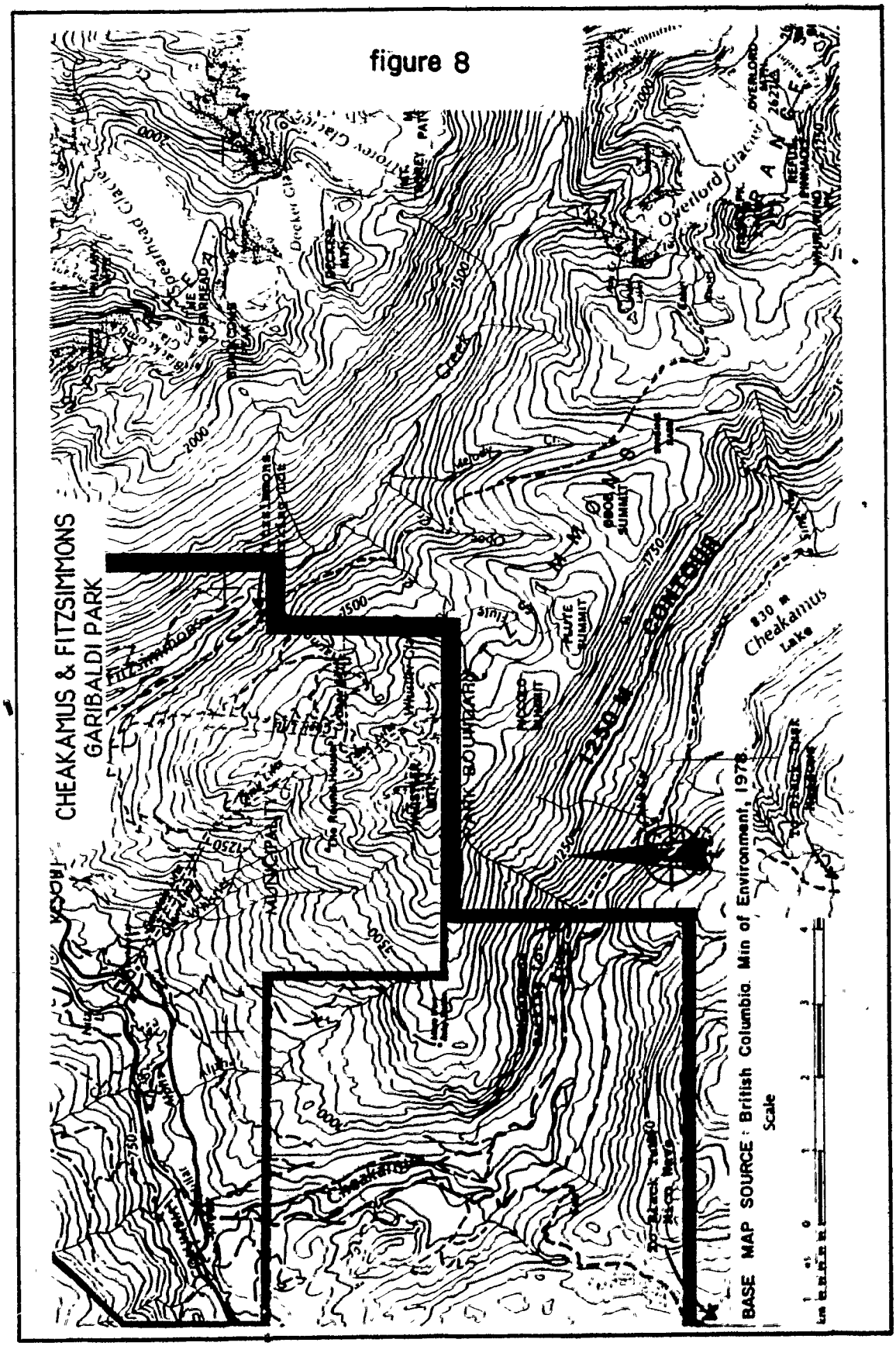
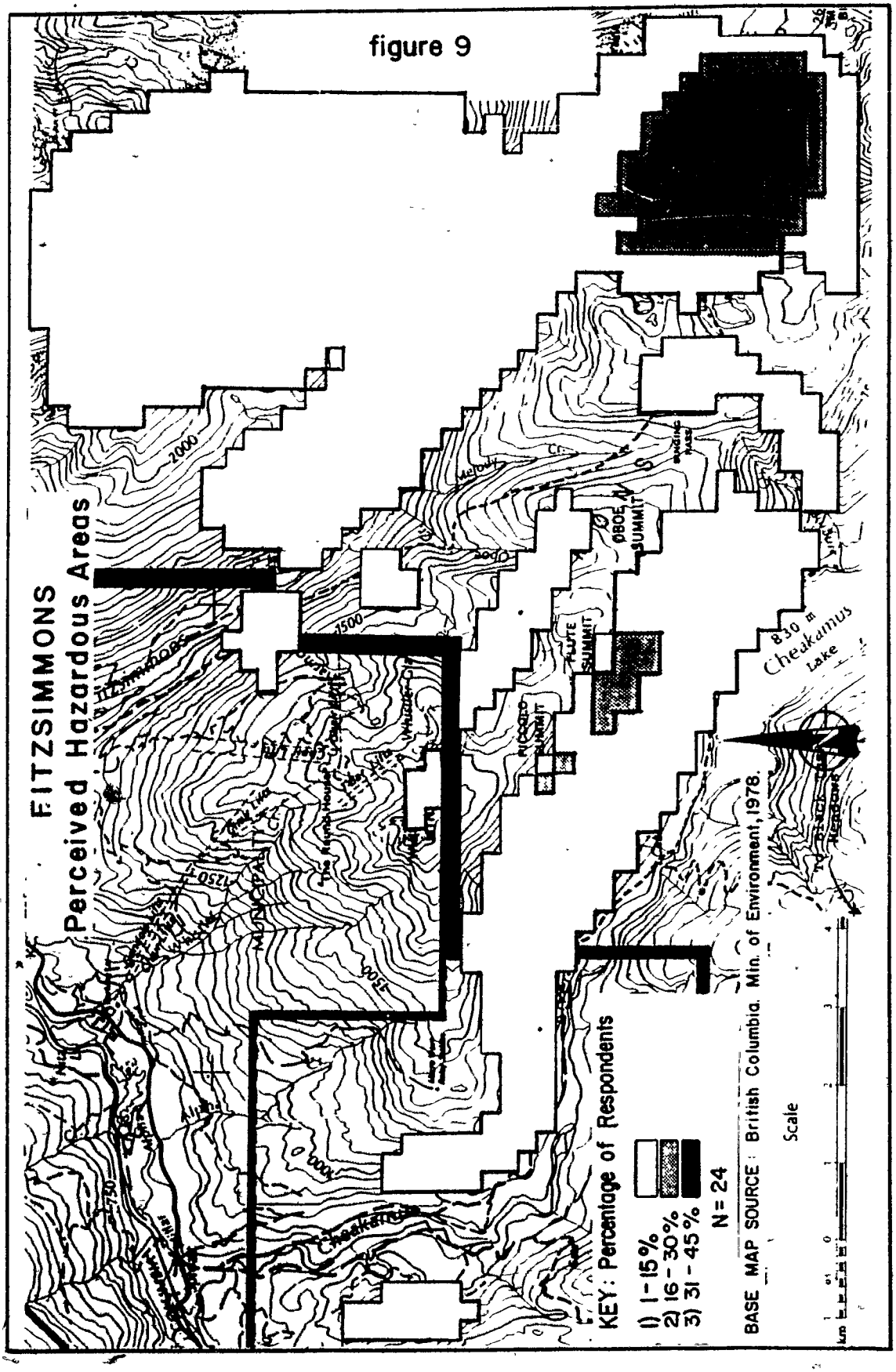
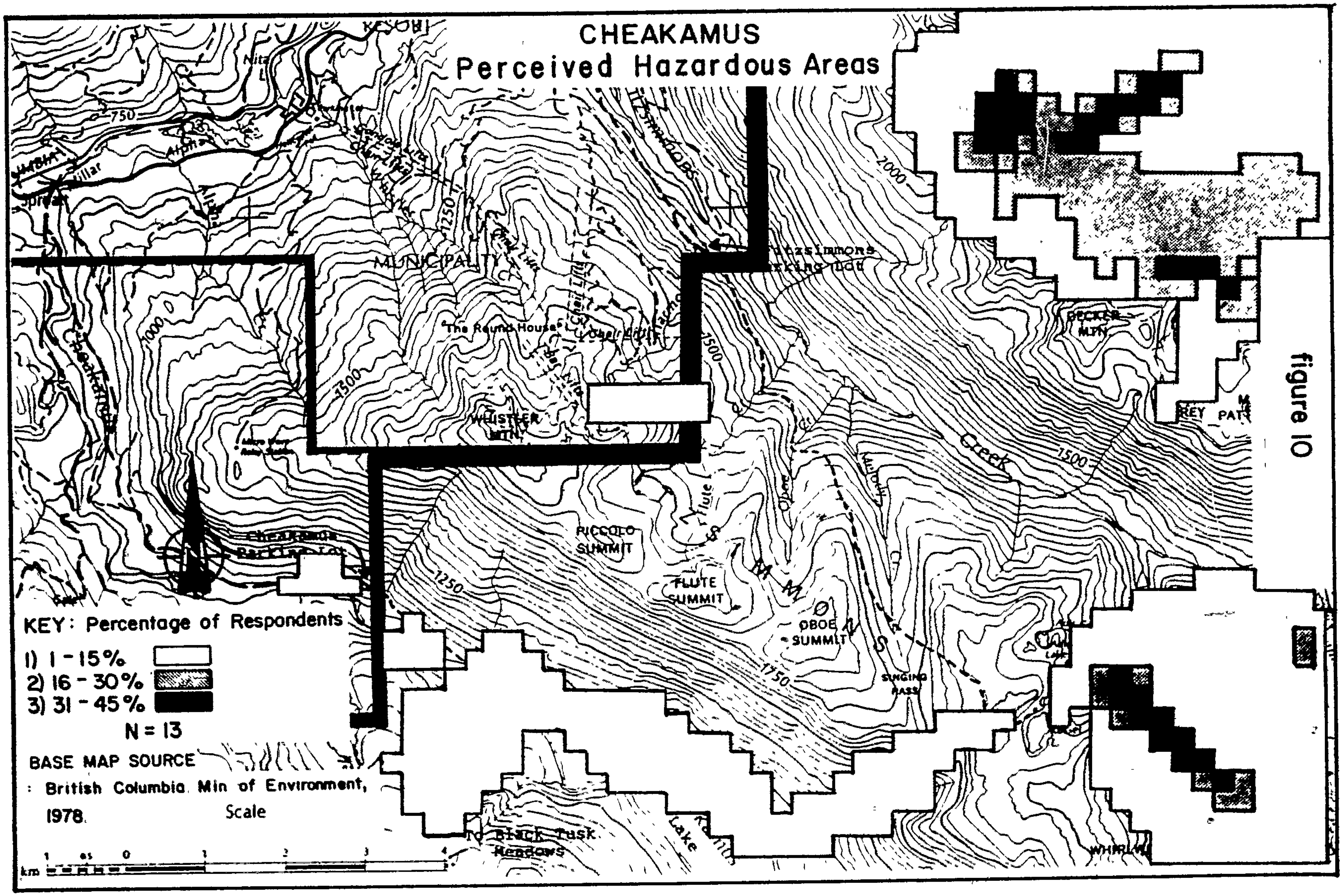

CHEAKAMUS & FITZSIMMONS
GARIBALDI PARK
Cheakamus Lake
830 m
BASE MAP SOURCE: British Columbia Min of Environment, 1978
Scale

figure 9


FITZSIMMONS
Perceived Hazardous Areas
KEY: Percentage of Respondents
1) 1-15%
2) 16-30%
3) 31-45%
N=24
BASE MAP SOURCE: British Columbia. Min. of Environment, 1978.
Scale
Cheakamus Lake
830 m
OBOE SUMMIT
FLUTE SUMMIT
PICCOLO SUMMIT
2000
1500
1250
1000
750


CHEAKAMUS
Perceived Hazardous Areas
figure 10
KEY: Percentage of Respondents
1) 1 - 15%
2) 16 - 30%
3) 31 - 45%
N = 13
BASE MAP SOURCE
: British Columbia Min of Environment,
1978.
Scale
km
MUNICIPALITY
The Round House
WHISTLER MTN
PICCOLO SUMMIT
FLUTE SUMMIT
OBOE SUMMIT
SINGING PASS
BECKER MTN
Creek
Lake
To Black Tusk Meadows
Fitzsimmons Parking Lot
Cheakamus Parking Lot
2000
1500
1250
1750
1000
750

high mountain glaciers. Generally, people circled larger areas at Fitzsimmons than in the Wedgemount Lake area. The responses to the right of Piccolo, Flute and Oboe Summits correspond to the number of visitors who hiked into Singing Pass along the ridge from Whistler Mountain.

Similar to the Wedgemount Lake area, the reasons respondents gave for circling areas as hazardous were mostly related to topography and/or geology; "glaciers," "crevasses," "avalanches" and "steep" were common responses. As at the Wedgemount Lake area, many respondents listed winter hazards.

CHEAKAMUS LAKE (Figure 10)

Like the Fitzsimmons users, people at Cheakamus Lake outlined the high mountain areas even though the respondents stayed at a low elevation near Cheakamus Lake. Perhaps these people had been to other areas in the park or they could see the glaciers toward the Singing Pass area from Cheakamus Lake. About seven areas were circled near Cheakamus Lake, Cheakamus River and the Helm Lake trail area; these are the only responses applicable to the actual Cheakamus Lake area. In comparison with the high mountain areas, most people did not feel that the Cheakamus Lake area is hazardous; the low response rate is probably indicative of this.

The reasons given for the circled hazardous areas were evenly spread amongst "topography and/or geology," "human," and "water bodies." Those responses that referred to "water bodies" are indicative of the different natural hazards in this area. As well, the

"human" responses may indicate that in relative terms with other hazards, people are attributed to causing many safety problems.

BLACK TUSK AREA (Figures 11 & 12)

Most people were localized in their choice of hazards -- more so than at the other areas. Hazards were perceived most at the Black Tusk. Many of the park users had climbed the Black Tusk -- had experienced it, and therefore perceived it as hazardous. Other minor modes of perception occurred at The Barrier and on the Helm Glacier; however, the response frequency for these areas was still 15 percent or lower.

The reasons visitors gave for outlining areas as hazardous were mostly related to topography and/or geology. However, "human" reasons were also given by about one-fifth of the respondents, indicating perhaps that human hazards are evident in this area.

DIAMOND HEAD (Figures 13 & 14)

In the Diamond Head area, as in the Black Tusk area, localized areas were perceived to be hazardous. The area near the Gargoyles was circled the most. The area immediately behind the Gargoyles, extending as far as the Garibaldi Neve, was perceived as hazardous. This area was probably perceived as hazardous due to the presence of glaciers, which are the dominating features even if one had only experienced this area visually. Only five responses occurred along the trail to the cabin, mostly along Paul Ridge.

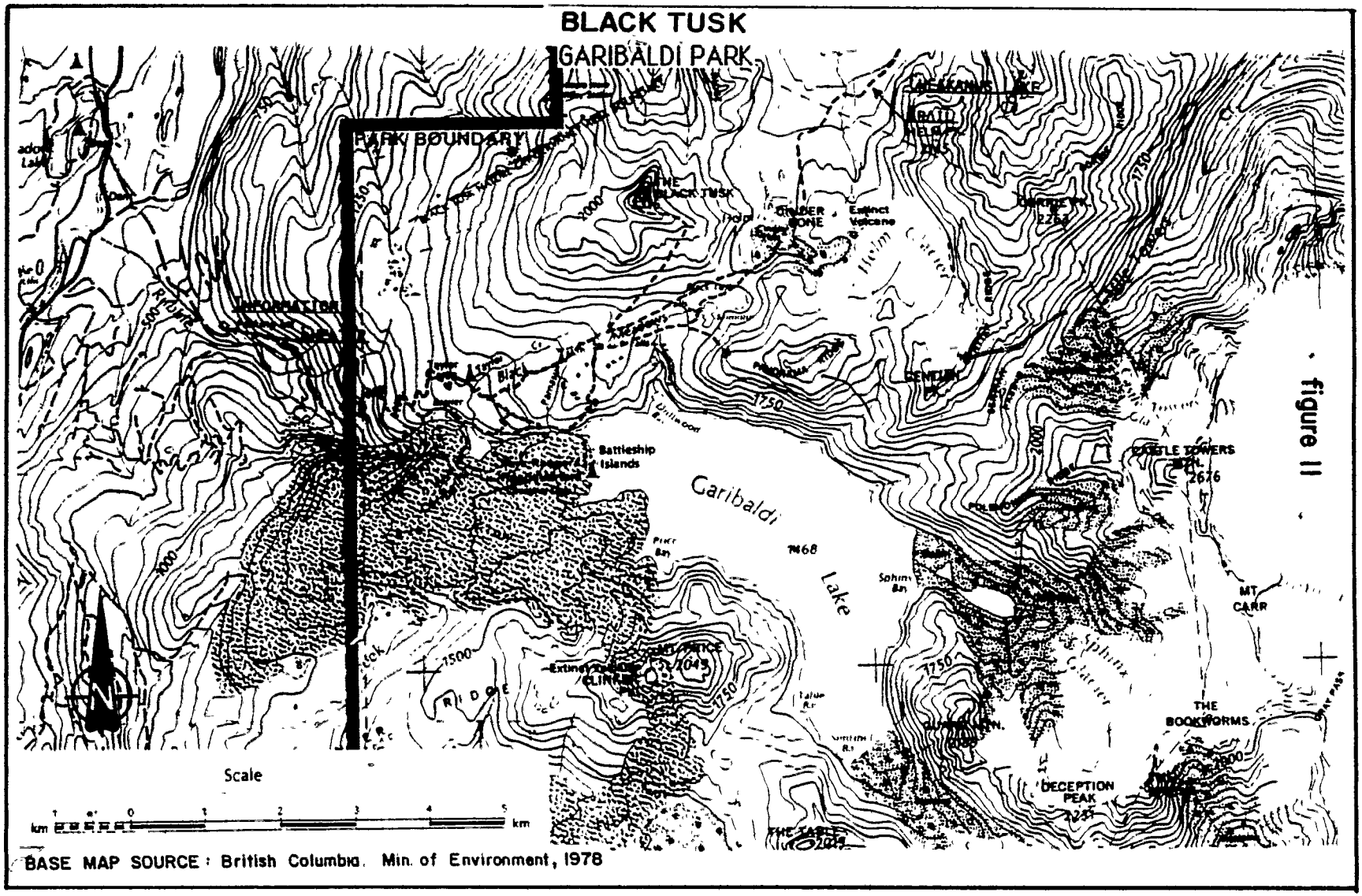

BLACK TUSK
GARIBALDI PARK
PARK BOUNDARY
THE BLACK TUSK
Extinct Volcano
Battleship Islands
Garibaldi
Lake
MT CARR
THE BOOKWORMS
DECEPTION PEAK
Scale
km
BASE MAP SOURCE : British Columbia. Min. of Environment, 1978

figure 11

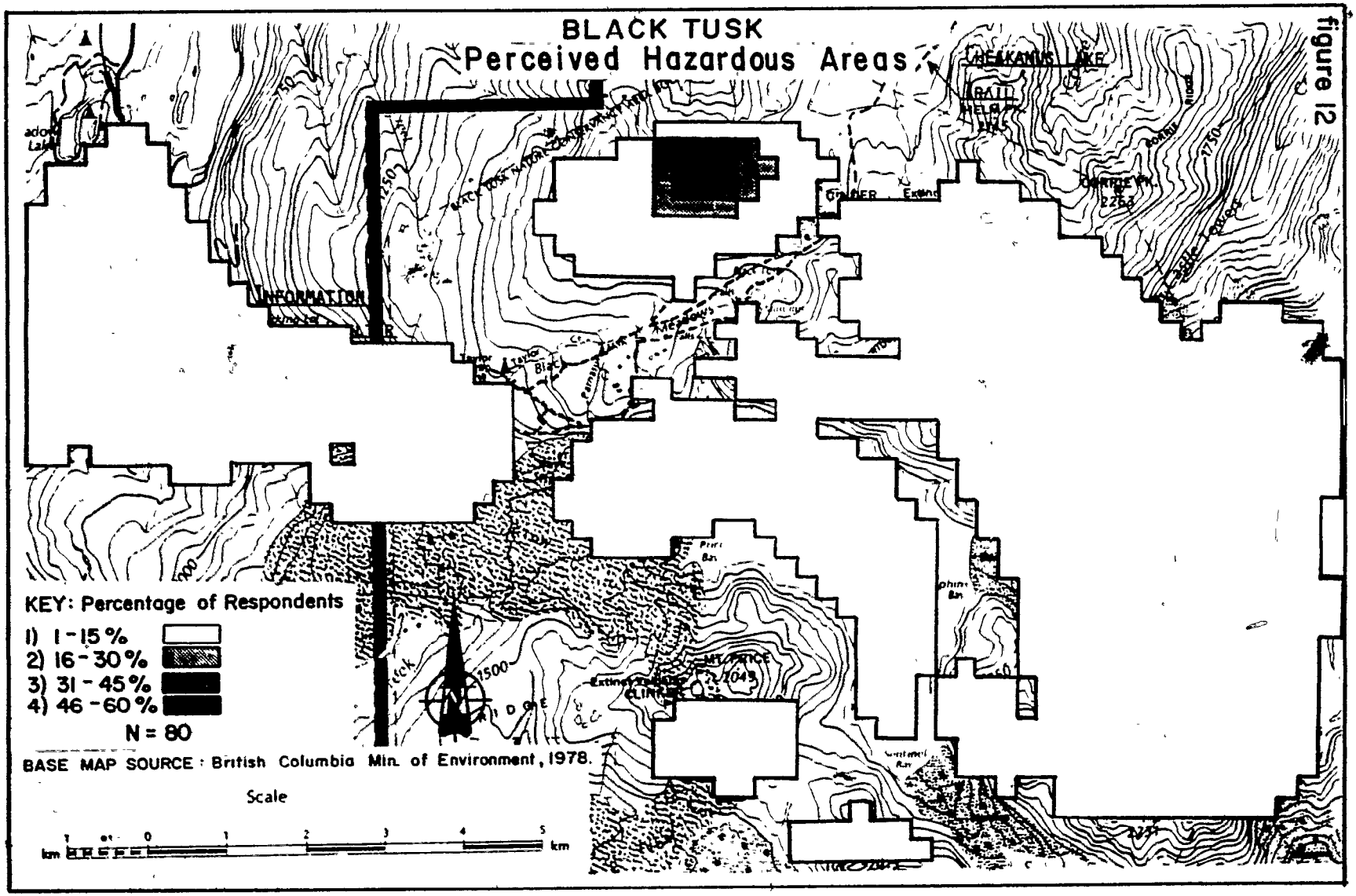
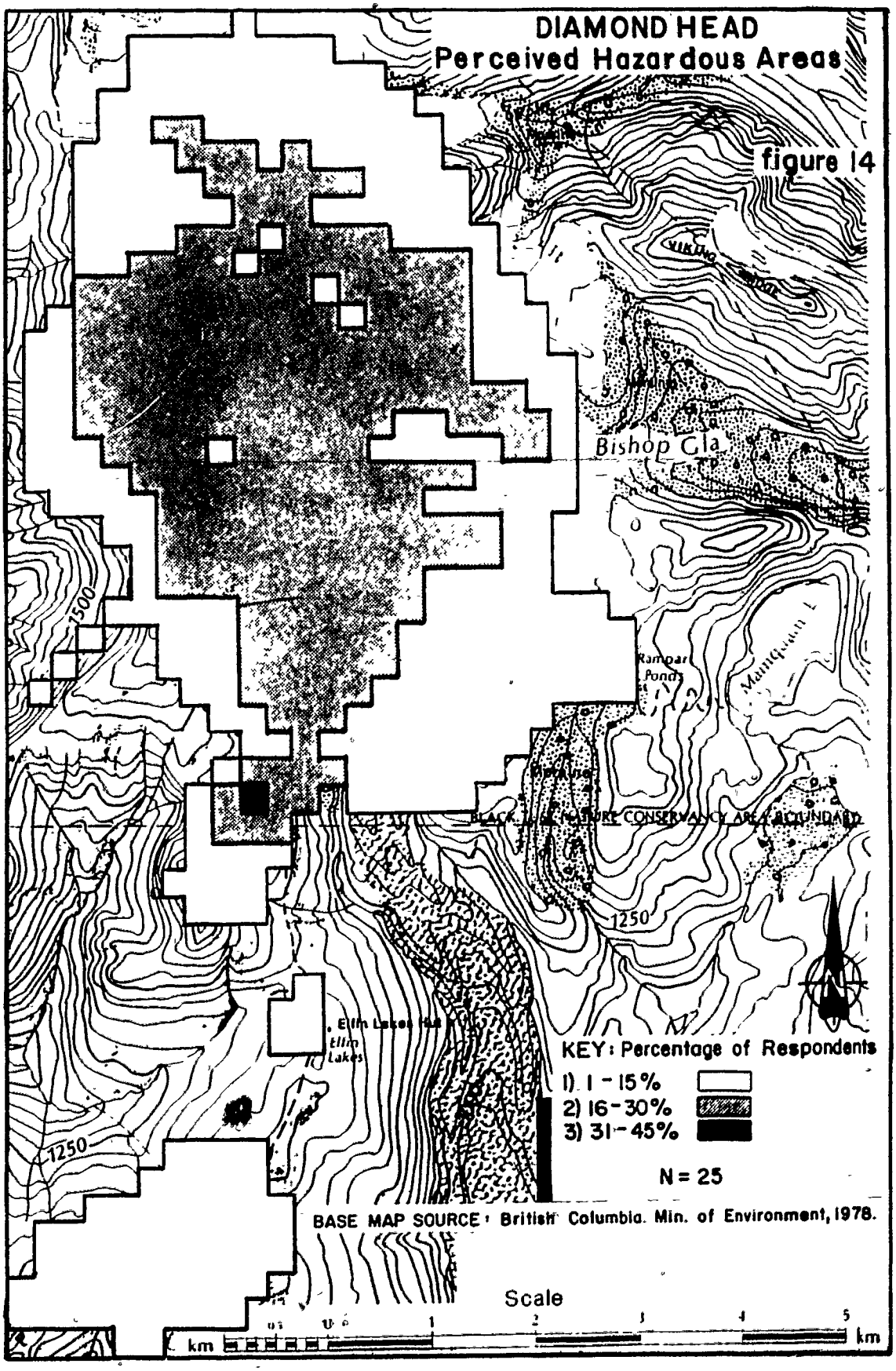

BLACK TUSK
Perceived Hazardous Areas
KEY: Percentage of Respondents
1) 1 - 15 %
2) 16 - 30 %
3) 31 - 45 %
4) 46 - 60 %
N = 80
BASE MAP SOURCE : British Columbia Min. of Environment, 1978.
Scale
km
km

figure 12


figure 13
DIAMOND HEAD
GARIBALDI PARK
2123
GLACIER PIKES
Garibaldi
MT. GARIBALDI 2678
RIDGE
Bishop Gla
PARK BOUNDARY
INFORMATION
SHELTER
BASE MAP SOURCE: British Columbia. Min. of Environment, 1978.
Scale
km
km


DIAMOND HEAD
Perceived Hazardous Areas
figure 14
Bishop Cla
1500
1250
1250
Elfin Lakes
KEY: Percentage of Respondents
1) 1 - 15%
2) 16 - 30%
3) 31 - 45%
N = 25
BASE MAP SOURCE: British Columbia. Min. of Environment, 1978.
Scale
km
km

Most respondents listed topography and/or geology as the reason for perceiving areas to be hazardous. "Human" reasons were not as common in the Diamond Head area as in all other areas except Fitzsimmons; the high response rate on the glaciers north of the Gargoyles is indicative of the large number of topographic and/or geologic reasons for hazards.

In general most people responded two ways to the map questions. Some respondents answered based on general knowledge -- for example, "all glaciers," even though they may not have been on one of the glaciers. A second group of people responded based on experiential knowledge; characteristically, responses involved localized areas which park users had experienced personally. This second type of response is the most useful for park managers who want to know where hazards exist and why they exist. The first type of response is more useful on a general level of what visitors to a mountainous park such as Garibaldi consider to be hazardous and why. The qualitative results indicate that the highest alpine areas are perceived to be most hazardous due to glaciers, avalanches and steepness. Perhaps many users were influenced by literature, which was their dominant source of wilderness safety information as discussed earlier under Characteristics Of The Trip. The low response rate to this question, however, may indicate that people were unfamiliar with the park and/or could not read a topographic map.

In terms of safety management the Black Tusk area should receive top priority due to the easily accessible Black Tusk being perceived as hazardous by almost half the respondents and the relatively large

proportion of "human" reasons for considering areas to be hazardous.

To conclude this hazard perception discussion, most Garibaldi Park respondents did not have much concern for the hazards listed. They did not, however, deny the existence of hazards. Most people did not perceive a great deal of danger in the trip taken; only about one half of the people expressed "some" danger. The most commonly perceived safety accidents or mishaps were not serious in intensity: "twisted ankles," "falls," "exposure" and " getting lost" in that order. Temporal factors -- such as warm weather and clear skies -- may have affected the concern for certain hazards -- for example, exposure. The most commonly perceived safety mishap cause, "improper preparation," was human derived, not a result of nature. In terms of safety management Wedgemount Lake would have priority since its users had the most safety concerns and the greatest perception of danger.

Experience

In floodplain studies, experience has been looked upon as a mechanism for adjustment to flood hazard -- if you experience more floods, you will take more precautions. Experience may also be a factor in wilderness recreation accidents. McFarlane (1985), however, has downplayed the role of activity experience in avalanche accidents. Of interest in Garibaldi Park was to see how experience affected perceptions and precautions taken.

Garibaldi Park users were evaluated for three types of experience: 1. experience in their chosen activity; 2. experience in Garibaldi Park and 3. experience of being lost or involved in a wilderness recreation

accident. Most respondents were experienced in their chosen activity (mostly hiking) and had at least six years of experience (Table 8). Thorsell (1971) found similar results which were qualified by asking people how experienced they thought they were; similar results materialized.

In this study, about 8 percent of respondents claimed to have less than one year's experience. Most people from all five areas had not done their particular trip before; they were experiencing a new environment in the park for the first time on all or part of their trip (Appendix 1.14). Such a response may lead to a lack of hazard perception and possible inappropriate precautions taken. The most experienced park users were in the Wedgemount Lake area; almost half of the Black Tusk area users had not been to Garibaldi Park before (Table 9). In all areas except Black Tusk the majority of people had been to different areas of Garibaldi Park (Appendix 1.15). Therefore, most respondents were spatially familiar with the park.

Perceived risk and hazard perception were probably a function of lack of experience in the park since most users were experienced in their activity. However, the majority of people from all park areas had not been lost or involved in a wilderness recreation accident (Table 10). Therefore, the majority of people were not taking precautions based on personal experience. According to hazard theory, there should be a relationship between experience and adjustment. In Garibaldi Park, experiencing a hazard is not a prerequisite for learning to adjust to the hazard; experience in activity and setting may be more important.

TABLE 8

AMOUNT OF EXPERIENCE IN GARIBALDI PARK RESPONDENTS' MAIN ACTIVITIES

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Less than 1 year	8.3	7.0	7.4	13.0	4.1
1 - 5 years	25.0	37.2	7.4	23.6	30.6
6 - 10 years	16.7	11.6	14.8	19.5	18.4
Over 10 years	50.0	44.2	70.4	43.9	46.9
	N=24	N=43	N=27	N=123	N=49

TABLE 9

NUMBER OF TIMES RESPONDENTS HAD BEEN TO GARIBALDI PARK BEFORE

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
none	16.7	26.2	13.8	47.6	14.9
1	---	2.4	10.3	4.8	10.6
2 - 5	12.5	21.4	41.4	22.6	40.4
6 - 10	16.7	9.5	13.8	12.9	12.8
11 - 20	20.8	9.5	10.3	8.1	10.6
21 or more	33.3	31.0	10.3	4.0	10.6
	N=24	N=42	N=29	N=124	N=47

TABLE 10

PERCENTAGE OF GARIBALDI PARK RESPONDENTS WHO HAVE BEEN LOST OR INVOLVED IN A WILDERNESS RECREATION MISHAP

WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
37.5	16.3	13.8	17.7	25.0
N=24	N=43	N=29	N=124	N=48

In conclusion, Garibaldi Park users were experienced in their chosen activity. Most visitors, however, were not well experienced in the park. Almost one-fourth of respondents had never been to Garibaldi Park before -- the highest concentration of these people was in the Black Tusk area. The largest fraction of people had been to the park between two and ten times before. Of the people that had been to the park before, about 69 percent had been to different areas of the park. Only about 22 percent of questionnaire respondents had been lost or involved in a wilderness recreation accident. In terms of safety management Black Tusk would have priority due to the large number of people there who had never been to Garibaldi Park before and the relatively high proportion of visitors with less than one year's experience in their activity.

Awareness of Managerial Adjustments

In floodplain studies those people who are aware of managerial adjustments have tended to taken more adjustments; they will also have a more realistic perception of the hazard (Kates, 1970). Of interest in the Garibaldi Park study is to see if the awareness of managerial adjustments varies between the five areas, and if it does, account for the differences.

The awareness level of managerial adjustments has several implications for safety. First, the awareness of managerial adjustments can give good information as to how people might react to an emergency situation. Perhaps where people are not aware of managerial adjustments in the park, there needs to be more safety

management. If people are not aware of managerial adjustments for safety, then perhaps they are not aware of safety hazards, and therefore do not take precautions; such a relationship has occurred on floodplains (Mitchell et al., 1977). The corollary is, however, that Garibaldi Park recreationists may take fewer precautions because they have a false sense of security. Perhaps there should not be an increase in the number of safety facilities, services, and regulations; instead they should be remarketed where there is a lack of awareness in the park.

"Park personnel," "trail markers" and "shelters" were the most common responses in the five areas of the park (Appendix 1.16). Proportionally more Wedgemount Lake respondents mentioned search and rescue than at the other four areas, probably due to the ruggedness and the higher proportion of mountaineering in the Wedgemount Lake area. The highest percentage of respondents who indicated park personnel, regulations and warning signs were in the Black Tusk area; this high response rate is probably a result of the most management occurring in that area.

In conclusion, about 19 percent of Garibaldi Park respondents indicated regulations, but most people did not list safety regulations. Safety facilities and services which serve only safety purposes -- for example, first-aid equipment or warning signs were not common answers; the lack of these types of responses is probably due to visitors' minimal experience in the park and the lack of apparentness of safety services and facilities. Since the awareness of managerial adjustments did not vary greatly between areas, one cannot assign priority to one

or a group of areas for safety management.

Personal Adjustments Taken

Adjustments can be long-term or short-term. In the case of Garibaldi Park this can mean educating oneself to deal with safety issues or taking precautions for the particular trip. One must consider why adjustments are taken and which ones are taken. For example, Burton et al. (1968) discovered that there were threshold points where people adjust to flooding. Do such thresholds exist in Garibaldi Park? Moreover, Burton et al. (1968) and White (1964) found that adopting adjustments on the floodplain was related to increased flood awareness (due to personal experience, flood frequency and perceived flood frequency). Therefore, those park users who have been involved in accidents, have become lost, or have come into contact with many hazards and those people who think that there are many hazards in Garibaldi Park should take more precautions. Finally, by studying precautions taken, one can determine whether people externalize park hazards to a higher power (take no precautions), or internalize these hazards (take precautions).

With regard to long-term adjustments results, only in the Wedgemount Lake and Fitzsimmons areas had the majority of people taken an outdoor related course in the past five years; the majority had not taken any one course in particular (Table 11). The majority of people in the other areas had not taken any of the courses listed during the past five years.

In fact, most people in Garibaldi Park are not that well prepared

TABLE 11

OUTDOOR RELATED COURSES TAKEN IN THE PAST FIVE YEARS IN GARIBALDI PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
First-aid	37.5	20.9	24.1	27.2	16.3
C.P.R.	29.2	34.9	24.1	27.2	28.6
Survival	12.5	4.7	6.9	10.4	8.2
Avalanche	45.8	14.0	10.3	12.0	6.1
Have taken no courses in past 5 years	37.5	45.0	69.2	51.7	54.2
Other(s)	29.2	16.3	6.9	12.8	8.2
	N=24	N=43	N=29	N=125	N=49

in terms of outdoor courses taken, especially those Wedgemount Lake users who must deal with several hazards. Only 25 percent of Garibaldi Park respondents had taken a first-aid course; only 29 percent of respondents had taken a Cardio-Pulmonary Resuscitation (C.P.R.) course; only 18 percent of the people had taken an avalanche course; and only 9 percent had taken a survival course. About 52 percent of respondents had taken no outdoor-related courses in the past five years. In terms of safety management Cheakamus Lake would be a priority area due to the lack of outdoor-related courses taken.

Short-term adjustments were taken more readily than long-term adjustments in all park areas. The most precautions taken were at the Wedgemount Lake area, which was probably due to the large number of mountaineers (Table 12). As well, there is a safety warning sign at the Wedgemount Lake trailhead entrance which may have encouraged people to take more precautions. In the other four areas the majority of people did not take a flashlight; the majority of respondents from the Diamond Head area also failed to take a map with them. Since most respondents were day hikers, perhaps they did not anticipate travelling at night or getting lost. In the Cheakamus Lake area the majority of people did not take a first-aid kit, perhaps due the short distance from the parking lot to the lake, the flat topography along the trail or the amount of time most people spent on their trip -- half a day. The majority of people at all park areas, however, claimed to take some precautions.

In conclusion, most park users adjusted to hazards only when necessary -- for example, in the Wedgemount Lake area. Nearly all

TABLE 12

PROPORTION OF USERS WHO TOOK PRECAUTIONS IN GARIBALDI PROVINCIAL PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Checked weather report	87.5	62.8	48.3	64.5	69.4
Left message telling where you were going	66.7	76.7	51.7	69.4	52.1
First-aid kit	66.7	51.2	37.9	53.2	55.1
Flashlight	66.7	23.3	24.1	31.5	36.7
Map of area	62.5	62.8	51.7	66.1	49.0
Extra food	75.0	69.8	69.0	58.1	65.3
Extra clothing	87.5	83.7	69.0	78.2	73.5
Wore hiking boots	79.2	60.5	34.5	50.0	53.1
No particular precautions taken	0.0	2.3	10.3	4.0	4.1
Other precautions	66.7	32.6	17.2	30.6	38.8
	N=24	N=43	N=29	N=124	N=49

visitors took precautions, but the number taken varied. Just over one-third of the respondents took additional precautions; only 4 percent of respondents indicated that they took no particular precautions. Most people checked the weather report, left a message telling where they were going, brought a map of the area, brought extra food and brought extra clothing. Other things being equal, in terms of safety management, Cheakamus Lake would be a priority area due to the lack of precautions taken.

Attitudes Toward Possible Managerial Adjustments

The actions that one takes when implementing safety management must consider the park user. The park manager must consider the theoretical range of adjustments (Burton et al., 1968); which possible action do the people want? -- for example, affect the cause? modify the hazard? modify the loss potential? Managerial adjustments in Garibaldi Park are synonymous with structural and non-structural adjustments on a river to prevent flooding; for example, trail modification is structural; safety literature is non-structural. One must look at the experiences that visitors want to fulfil in the park and find a compatible medium.

There was little variation in attitudes toward possible safety management adjustments between the five park areas (Appendix 1.17). The most common response was "support." However, in the Wedgemount Lake area a large proportion of the respondents were "undecided" with regard to mandatory sign-in and sign-out procedures; perhaps these people wanted more independence due to the high proportion of

mountaineers. As well, in the Diamond Head area there was mixed reception to enforced safety regulations; only slightly more people supported the proposition than opposed it.

In general, most respondents were favourable to possible safety management in Garibaldi Park. All facilities, services and regulations designed for people's safety were well accepted by the respondents -- safety management would not negatively affect their desired wilderness experiences. The least popular proposals were mandatory sign-in and sign-out procedures and enforced safety regulations. Fitzsimmons and Cheakamus Lake would be priority areas for safety management in terms of user attitudes.

3.4 Visitor Activity Profiles For The Five Sampling Areas Of Garibaldi Park

The previous section of Chapter Three has looked at safety perceptions and preparedness in spatial terms. It is also of interest to analyze and compare safety perceptions and preparedness in terms of activity, so that the most accident prone users can be identified. These activity profiles are constructed first in spatial terms, second in terms of susceptibility to hazards and third in terms of desire for park safety management. The methodology employed involves the crosstabulation of the activity variable with other variables, such as precautions taken. As in the previous section, there were no Chi square statistics taken due to many of the contingency cells having expected frequencies less than five; thus, the results are Garibaldi Park specific. In addition, perceived hazardous area maps were compared between the different activity groups of the Wedgemount Lake

area; the other areas were composed predominantly of hikers and therefore such a comparison of map hazards did not take place.

Wedgemount Lake

There were generally two user groups in the Wedgemount Lake area: mountaineers and hikers. In this analysis, hikers are comprised also of campers and sightseers; mountaineers make up about 42 percent of the group. In terms of destination most mountaineers went up Mt. Wedge and/or Mt. Weart; most hikers went as far as Wedgemount Lake. The major source of wilderness safety information varied between the two user groups. Most hikers learned safety from reading; most mountaineers learned safety from other people, that is, non-theoretical sources.

Most mountaineers perceived an extreme amount of danger if appropriate precautions were not taken; most hikers perceived some to a moderate amount of danger. Referring to Figures 15 and 16, one can see hazard perception differences which existed between the two activity groups. The hikers were concerned about the steep hill before the Wedgemount Lake cabin, whereas the mountaineers felt that the most hazardous areas existed on the Wedgemount Glacier. Clearly, the hikers' and mountaineers' different experiences influenced their choice of perceived hazardous locations.

In terms of experience both activity groups claimed to have done their activities for many years; the only users with less than one year's experience were hikers. Mountaineers had been to Garibaldi Park more often than hikers. Finally, most mountaineers had been lost or

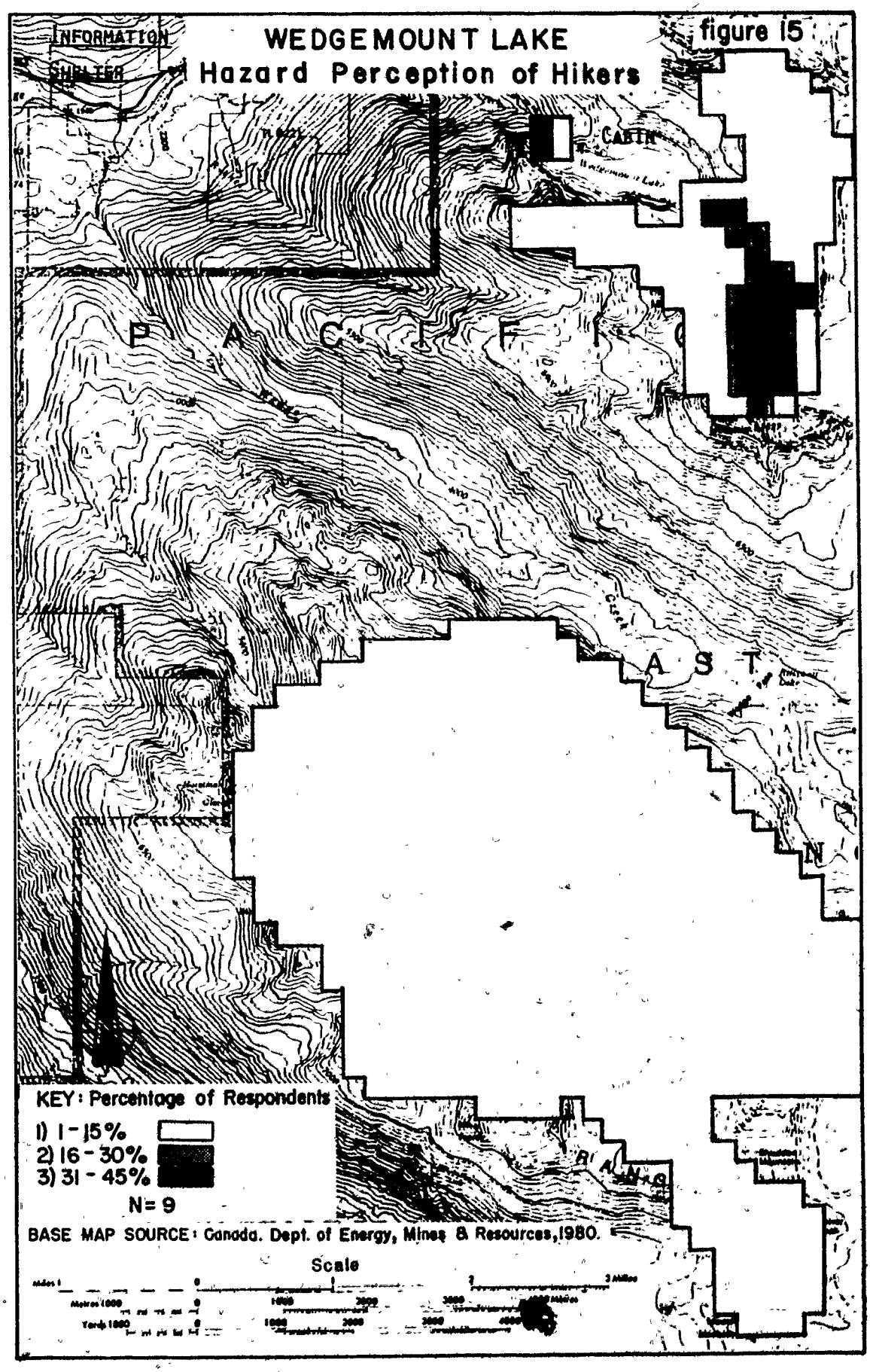
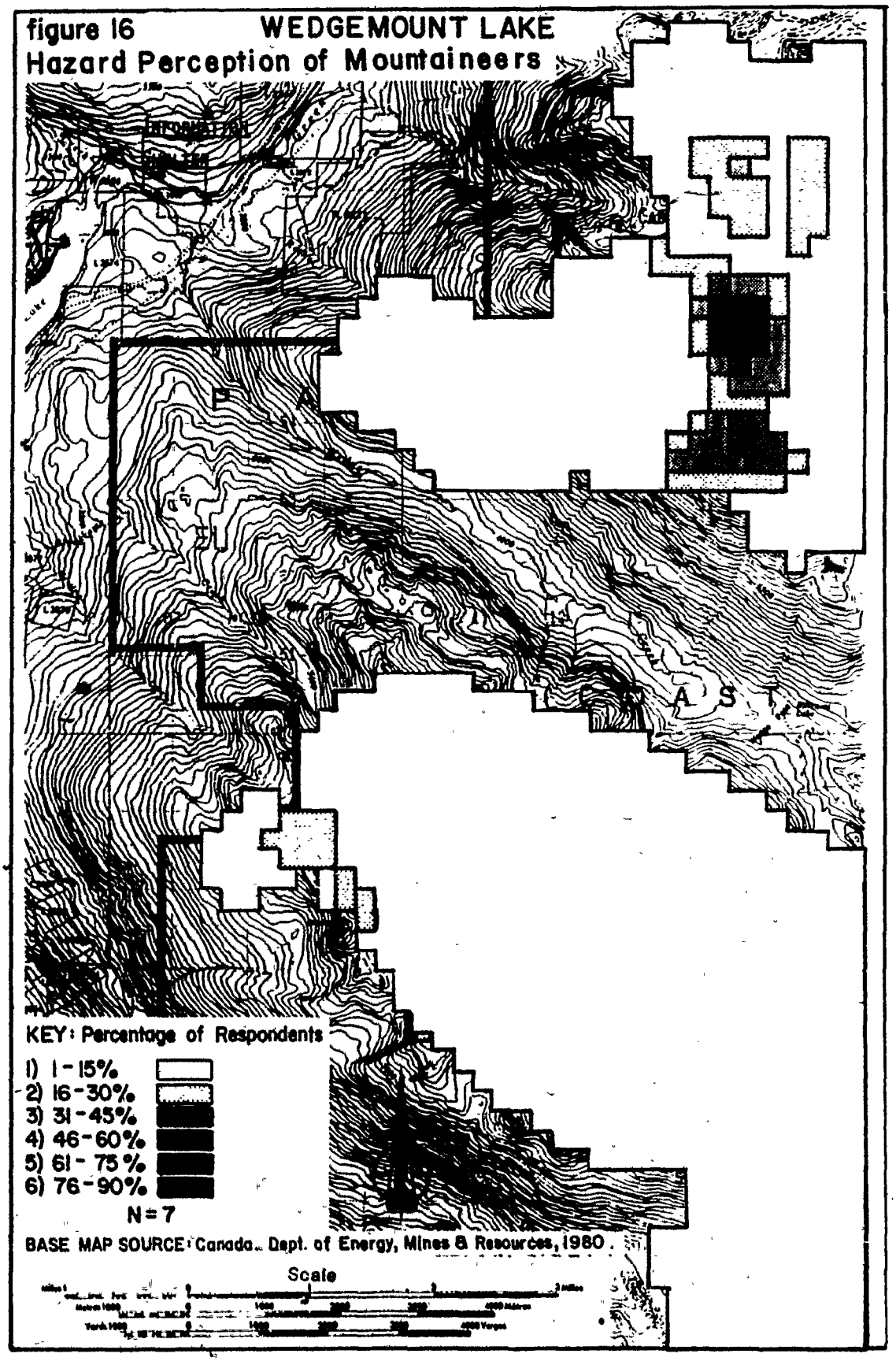

WEDGEMOUNT LAKE
Hazard Perception of Hikers
figure 15
INFORMATION
SHELTER
CABIN
PACIFIC
COAST
KEY: Percentage of Respondents
1) 1 - 15%
2) 16 - 30%
3) 31 - 45%
N= 9
BASE MAP SOURCE: Canada. Dept. of Energy, Mines & Resources, 1980.
Scale

figure 16 WEDGEMOUNT LAKE
Hazard Perception of Mountaineers



involved in a wilderness recreation accident -- most hikers had not.

Proportionally more mountaineers took precautions than hikers. Almost all mountaineers brought first-aid kits, flashlights and maps, while only half of the hikers brought them. All mountaineers wore boots, whereas less than two-thirds of the hikers wore boots.

The attitudes toward proposed safety management in the park varied between the two user groups. First, hikers were more supportive of hazard signs and mandatory sign-in sign-out procedures. Finally, hikers were more undecided about enforced safety regulations; most mountaineers did not want enforced safety regulations.

In summary, basic safety differences existed between hikers and mountaineers. Hikers learned about safety from theoretical sources -- for example, books -- while mountaineers learned safety from practical sources -- for example, other people. Mountaineers were generally more experienced in terms of Garibaldi Park, activity chosen, and involvement in accidents or safety mishaps. Nearly all mountaineers and over half the hikers took at least one additional precaution. Hikers were more supportive of safety management than mountaineers.

With regard to danger perception and adjustments taken toward hazards, hikers were most susceptible to an accident or mishap; they took proportionally fewer adjustments than mountaineers; therefore, safety management should be directed to hikers, not mountaineers. However, differences in attitudes toward safety management should be considered so that mountaineers are not displaced outside the Wedgemount Lake area.

Fitzsimmons

There is really only one visitor group in the Fitzsimmons area -- hikers. Only one person claimed to be a mountaineer. Hence, the discussion of the different activity groups will be brief since it has for the most part been covered in the previous part of Chapter Three where Fitzsimmons users were generally treated as a homogeneous group of hikers.

Although not statistically valid, major differences did exist between the two visitor activity profiles. The one mountaineer had more experience in activity, the particular trip taken and Garibaldi Park, and the mountaineer had been lost or involved in a wilderness recreation accident. The mountaineer took more precautions than most of the hikers. However, as in the Wedgemount Lake area the mountaineer was much less supportive of proposed safety management, particularly mandatory sign-in and sign-out procedures and enforced safety regulations.

Planning safety management in the Fitzsimmons area could involve displacing some mountaineers if the responses given are indicative of others. However, summer mountaineering in this area is much less common than hiking, and hikers are generally in favour of safety management.

Cheakamus Lake

Roughly 90 percent of Cheakamus Lake area users were hikers (including campers and sightseers); the remainder were involved in water activities, which consist of fishing and canoeing. Due to the

low response rate for the Cheakamus Lake area (N=24 out of 82), the visitor activity profiles discussed here are based on limited data.

Differences did exist between the hiking and water activity groups. Most hikers were in the park for half a day whereas most of the water activity participants were in the park for one day. Most hikers had not done their trip before whereas two of the three water activity participants had. Most hikers had been to Garibaldi park between two and 10 times whereas people involved in water activities had been to the park between one and 10 times. Most water activity participants took more precautions than hikers. However, over half of the hikers left a message telling where they were going and brought extra food; most water activity participants did not. Of all the hiking respondents, 12 percent indicated that they took no particular precautions; all water activity participants did take some precautions.

In light of the above differences there would be no displacement of water activity participants if safety planning were to occur for the dominant hiker user group -- both user groups were generally supportive of safety management.

Black Tusk

In the Black Tusk area, hikers accounted for over 91 percent of respondents (including respondents involved in sightseeing, photography, sketching, camping and recuperating). Roughly 6 percent of respondents were involved in water activities (hiking-fishing and hiking-swimming) and about 3 percent responded as hiker-climbers.

In terms of characteristics of the trip the most common response

as a destination for hikers was Garibaldi Lake; however, many people also included a visit to the Black Tusk; most water activity participants went just to Garibaldi Lake; most climbers went up Black Tusk. Challenge and risk was a main motivation for only 1.8 percent of hikers and 25 percent of the mountaineers (i.e., one).

With regard to perception differences half the climbers perceived "large" amounts of danger while most hikers and water activity participants perceived only "some" to "moderate" amounts of danger.

Most climbers did not take more precautions than hikers or water activity participants. The hikers generally took more precautions than the water activity participants.

With regard to experience in the park, hikers and water activity participants were more experienced than climbers -- most climbers had not been to the park before.

All proposed safety management was supported by the three visitor activity groups except for the following. Climbers were least supportive of warming huts in the park. Water activity participants were generally more supportive of mandatory sign-in and sign-out procedures than hikers or climbers. Finally, most water activity participants and climbers supported enforced safety regulations more than hikers.

In conclusion, the three visitor activity profiles shared similar characteristics. One cannot easily compare the climbers from Black Tusk with the mountaineers from the Wedgemount Lake area -- the mountaineers were more experienced and took more precautions. The hikers and water activity participants generally had the same

characteristics as their respective activity groups in the other park areas. One should, however, consider the different activities when planning safety, taking into consideration that the majority of users are hikers and that the safety characteristics of users between activities does not vary.

Diamond Head

As in all the park areas surveyed except Wedgemount Lake, hiking was the dominant visitor activity profile in the Diamond Head area, accounting for almost 94 percent of respondents. There was one fisherman, 2 percent of the response, and two mountaineers, 4 percent of the responses.

Differences existed between the three groups with regard to the characteristics of the trip. Most hikers went to Elfin Lakes and the Gargoyles; the fisherman went to Mamquam Lake; and the mountaineers climbed Mt. Garibaldi.

In terms of perception differences the fisherman and the two mountaineers perceived more danger in their trip taken than most of the hikers, who perceived "some" danger.

The mountaineers took the most precautions, followed by the fisherman, then the hikers.

The two mountaineers had been to Garibaldi Park more often than the respondents in the other two user groups. The fisherman and one mountaineer had been lost or involved in a wilderness recreation accident whereas most of the hikers had not.

With regard to attitudes toward safety management, hikers were

2 of/de 2

1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8

MicroD

generally more supportive than the mountaineers or the fisherman. The mountaineers and the fisherman were opposed to signs identifying hazards, mandatory sign-in and sign-out procedures, and enforced safety regulations.

In conclusion, the fisherman and mountaineers generally perceived more danger than the hikers, and took more precautions as a result. The hikers were, however, more favourable toward proposed safety management, especially mandatory sign-in and sign-out procedures and enforced safety regulations. The hikers must be targeted in terms of safety management since they made up the largest activity group and many precautions were not adopted or were adopted poorly by the hikers -- for example, carrying a flashlight and a first-aid kit.

In conclusion, some safety perception trends were noticed by analyzing the different activity groups in Garibaldi Park. Mountaineers generally were most experienced in terms of Garibaldi Park and in terms of activity, had been lost or involved in a wilderness recreation accident, took more precautions than the other user groups and were least supportive of safety management, especially mandatory sign-in and sign-out procedures and enforced safety regulations. The hikers and water activity participants (as classified earlier in the analysis) generally shared the same safety perceptions.

By combining this activity analysis with the previous spatial analysis, one can determine where the different activity groups are located and the effect the regional environments have on safety perceptions. Having combined the two analyses, one is better able to target safety management in terms of where visitor activity groups are

located. At a park management level, the hiking user group should be targeted for safety management since hikers account for most of the users in the park, are least experienced, take fewer precautions and are most supportive of safety management. In terms of location, those hikers ascending The Black Tusk should be targeted first due to their inexperience and their minimal concern for hazards. A more systematic approach for planning safety which incorporates users' perceptions will be considered in Chapters Four and Five as we now turn to focus on the management component of safety planning.

CHAPTER FOUR

EXISTING PARK MANAGEMENT TECHNIQUES FOR PLANNING SAFETY

In Chapter Two, background information relating to hazard and risk perception studies was discussed. Chapter Three looked at the perceptions of Garibaldi Park users as a factor of user safety and safety planning.

Chapter Four reviews the park planning process, its operationalization of user perceptions, and the treatment of safety as a park planning issue. The first part of Chapter Four gives examples of facilities, services and regulations which directly or indirectly enhance safety.

4.1 Facilities, Services And Regulations

The end product of park safety planning is the location and operationalization of facilities, services and regulations which enhance safety. It is useful to discuss these end products first so that one can understand the kinds of things that are being used to manage safety. Examples from Garibaldi Park will be used throughout the discussion.

Facilities are physical structures. They may be components of a service and can range from warden stations to signs warning people about hazards; other facilities -- for example, shelters -- serve a dual purpose, in this case comfort and safety. One measure to increase safety awareness includes locating signs to indicate hazards such as weather and cliffs. These signs increase one's immediate awareness of

safety hazards; however, they do nothing to predispose one's attitudes toward safety, unlike more detailed safety literature. In the Scottish Highlands near Ben Nevis is an example of preventive accident planning, display boards are placed to inform hikers and climbers of weather and avalanche conditions (MacInnes, 1972). There is no universal strategy for locating safety facilities; the decision-making is done at the regional or park level within the policy guidelines of the park agency responsible.

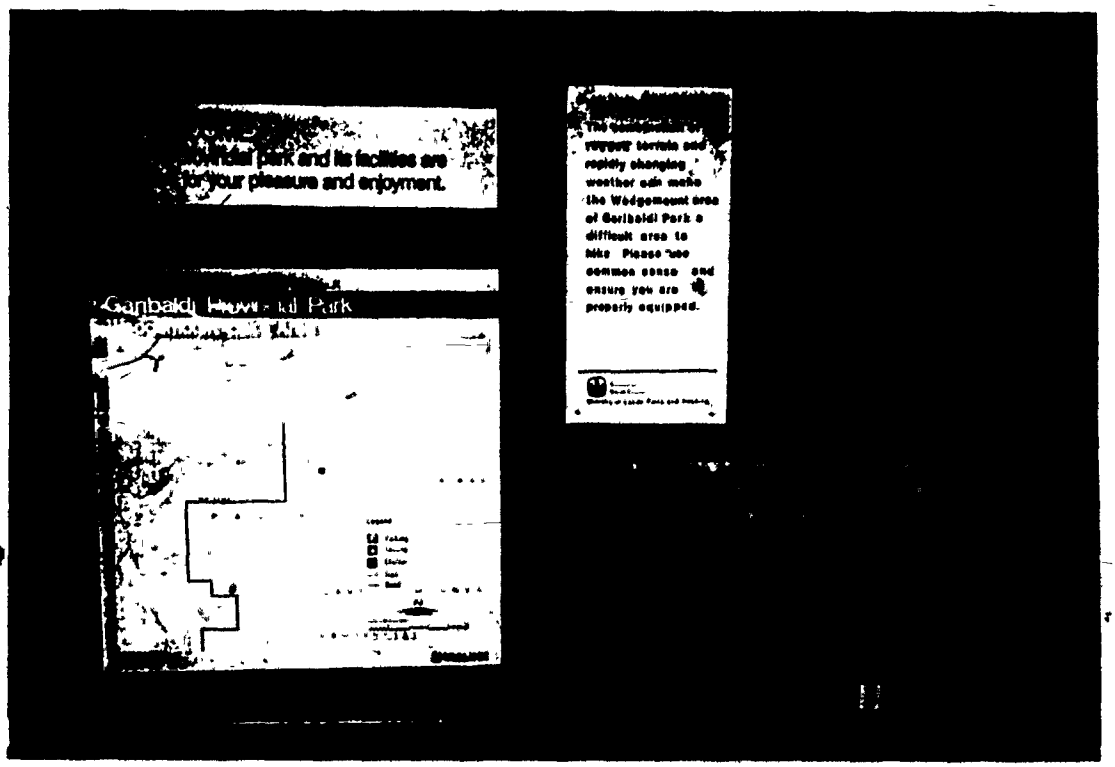
In Garibaldi Park, shelters are found at Red Heather and Elfin Lakes in the Diamond Head area; Taylor Meadows, Garibaldi Lake, Sphinx Bay and Sentinel Bay in the Black Tusk area; Russet Lake in the Fitzsimmons area; and at Wedgemount Lake in the Wedgemount Lake area. The trailhead register is also a safety service found in Garibaldi Park. Kiosks with large topographic maps, warning signs and other information are present at the five trailheads where sampling took place (Figure 17).

Services differ from facilities in that they may only alter the psycho-social environment -- their location is not as tied to the physical environment as facilities. However, a service may involve the use of some facilities -- for example, a ranger's station for Search and Rescue.

Search and Rescue (SAR) is the most important service in terms of safety; it assumes that accidents will happen. Its purposes are to search for wilderness recreationists who have not returned from their trip and to rescue recreationists who have become immobilized due to personal injury. A SAR service normally consists of teams composed of

Figure 17

GARIBALDI PARK INFORMATION KIOSK AT THE WEDGEMOUNT LAKE TRAILHEAD.



experienced volunteer recreationists who are trained in first-aid and rescue procedures, or more formal personnel such as those in fire departments, or the military may be involved. Search and Rescue can be allocated regionally, that is in wilderness recreation areas which are not designated parkland, or on a park by park basis. The size, climate, topography and use level of a recreation area are criteria used to decide what kind of Search and Rescue services are necessary. Often the communities located in close proximity to recreation areas will incorporate a Search and Rescue program into their own emergency plan -- for example, the North and West Vancouver, British Columbia Emergency Program. Accident reports, more than user perceptions, are used to determine whether a region or park should have a SAR team and how it should be designed.

In Canada most SAR procedures are affiliated with the Royal Canadian Mounted Police (RCMP). Although many searches are carried out by park staff, it is often the RCMP who receive the call for assistance first (Jefferd, Personal Communication, August 1986). Furthermore, local rescue teams may be involved in a search regardless of whether the land is managed by a park -- for example, the Whistler Mountain, British Columbia, Search and Rescue team (Cathers, Personal Communication, January 1987). The budgets of many park agencies are limited; thus, the only means to facilitate satisfactory Search and Rescue procedures is often by co-operating with the local community and the RCMP. Where population centres are small and distant from the park -- for example, Mt. McKinley National Park, Alaska -- the park agency must bear almost all Search and Rescue costs ("Mountaineer's father

unhappy...," 20 August 1980).

In the United States the quality of SAR can also be dependent on park location. On the national scale most U.S. National Park rangers are trained for Search and Rescue operations; many of them are even trained as paramedics (Toops, 1985). Their skills, however, are often dependent on park locations since activities and natural hazards in the parks dictate the appropriate training. Like their Canadian counterparts, U.S. National Parks utilize outside help in Search and Rescue operations as much as possible. For example, in smaller more developed parks such as historic sites, the local police and medical services are often given the responsibility of rescue in case of accidents (Toops, 1985). Also alpine clubs assist SAR in Yosemite, Olympic and Mt. Rainier National Parks (Toops, 1985). Where SAR on a large scale is needed, the U.S. National Parks often call upon the military for assistance. Therefore, the availability of safety services may also be dependent on the size of population centres near the park and park user density.

In Britain, park Search and Rescue tends to be well organized and systematic. MacInnes (1972) has described predetermined search patterns cartographically which are used whenever climbers or skiers become lost. In Britain the park use levels are high while their land bases are small; therefore, advanced safety planning is needed.

In British Columbia parks, where downhill ski facilities exist, safety plans have been developed for some downhill ski areas. The "Cypress Provincial Park Snow Safety Plan" (British Columbia, April 1978), assesses and classifies those areas which are prone to avalanche

by visually outlining the affected region on aerial photographs. The responsibilities of the ski hill employees are outlined; then contingency plans for such things as chairlift evacuation and avalanche Search and Rescue are given (British Columbia, April 1978).

Unfortunately, in locating and assessing hazardous areas the perceptions of skiers have not been used. Such information would provide a better understanding of the likely behaviour of skiers, which in turn might help to modify contingency plans.

British Columbia Parks Branch rangers are also a safety service. For example, in Garibaldi Park, the Diamond head management plan explicitly states that public safety is part of a ranger's duties (British Columbia, 1974). First-aid services are present at Garibaldi Lake in the Black Tusk area (Outdoor Recreation Council of British Columbia, May 1986). The Outdoor Recreation Council of British Columbia also produces brochures on safety issues pertaining to topics such as hiking and canoeing.

Park facilities and services try to enhance park safety; failing this they try to lower the impact of accidents. The goal of park regulations is to alter user behaviour so that accidents do not occur.

Two ways of managing negative behaviour are by using direct and indirect regulations. Direct regulations are rules; indirect regulations are implied, but not enforced -- for example, the development of campsites. The camper is encouraged to utilize the sites provided by the park manager; park management can then prevent ecological degradation. Indirect regulations are favoured because they seemingly give the recreationist more freedom, and they require less

monitoring by park managers; however, direct regulations are known to be more effective when behavioural problems get out of hand.

Park regulations also exist to prevent dangerous behaviour. The most obvious Garibaldi Park safety regulations are those regulating behaviour in the civil defense zone beneath and adjacent to The Barrier. Other summer-time regulations which indirectly affect safety are those which restrict mountain bikes to certain areas, restrict motor vehicle traffic in the park and restrict the discharge of firearms in the nature conservancy zone (British Columbia, 1986). Restrictions regarding motor vehicles, firearm use and dogs were posted at all or some of the park entrances when sampling took place, and the Civil Defense Zone was also well posted. In the British Columbia Park Act, the most relevant regulation to safety is Regulation 44 which states that "Animals must be under control, restraint may be required" and that "...to restrain such animal as may be necessary to public convenience and safety" (British Columbia, Park Act, 1984, p.9). In general, there are no stringent safety regulations in Garibaldi Park such as mandatory registration.

Often is is difficult to discern differences between environmental regulations and social regulations. For example, visitors using The Barrier trail to get to Garibaldi Lake or Taylor Meadows are encouraged not to take short-cuts along the steep switch-backed part of the trail; preserving the ecology of the area is the posted reason; however, safety is also a concern (Stetski, Personal Communication, July 1986).

Political factors can also cause regional differences in the location of safety regulations. In the Soviet Union, for example, park

safety regulations are much tighter than in North America or Britain, pre-empting the need for such costly Search and Rescue services. All climbers venturing into high alpine areas, for example, are required to successfully clear an inspection of their mountaineering skills. Therefore, Soviet mountaineers' long term precautions, which are a function of their perceptions, are considered. They then must abide by a mandatory registration for each proposed climb (MacInnes, 1972). Clearly, regulations have an impact on the safety of user behaviour as may some facilities and regulations. However, accident statistics are the dominant factor when deciding to implement facilities, services or regulations -- perceptions and associated preparedness play a minor role.

4.2 Current Planning Strategies At The Park Level

Park planning can be divided into two phases: the pre-design phase before the park has a firm management plan, and the upgrading phase where safety planning -- or more appropriately, management -- is updated through time. In Canada most park agencies have followed the latter approach.

In general, parks are planned based on the intuition of the park managers and planners, which is normally a product of years of experience. By informally analyzing the quality of experience enjoyed by park visitors through verbal communication or reports of other park wardens, the park manager is able to take direct action toward a planning or management problem. However, park managers may not always perceive reality. For example, United States recreation administrators

were found to perceive participants to be more at risk when participating in air activities than land, self-defense, water or snow activities (Dunn and Gulbis, 1976).

Safety planning does not take perception or behavioural information into consideration, nor is the allocation of safety management systematic.

Normally the allocation of safety management is through hindsight or is done in a very haphazard way. For example, warning signs may be located in steep areas because someone fell part way down a cliff or because the park manager thought that there was potential for an accident. A couple of years later regulations may be imposed in the park whereby people can only perform certain activities in certain areas due to the severity of hazards present. User behaviour and/or perceptions are not explicitly considered.

Unfortunately the only usual form of public participation consists of accident frequencies in a particular park locale (Christiansen, 1985). This is an after-the-fact approach to planning; lives can be saved and injuries prevented if predisposing attitudes and perceptions are taken before accidents have a chance to happen. Unfortunately no broad framework seems to exist from which park managers can model their own safety plan.

4.3 Public Participation In The Park Planning Process

Public participation in park decision-making usually involves public meetings, questionnaires or interviews (e.g. Canada, Department of the Environment, March 1985). Through such contact, park managers

can learn about users' perceptions, attitudes and concerns. This information can then be used by managers to formulate decisions.

The incorporation of user perceptions through the use of questionnaires is not the same as observable behaviour; however, the information being used is inferred behaviour. This new planning design has begun to open up the field of social science survey research with the development of many questionnaire designs -- the objective is to infer behaviour.

4.4 Land Management Systems

When decisions are made in a park they are usually made with reference to a park plan. Many parks have developed their own plans; others have used land management frameworks to develop plans. The park management frameworks are used for areal planning -- for example, zoning an area for safety. The modification of the physical or psycho-social environment within each area -- for example, the safety facilities, services and regulations listed previously -- is known as site planning. The following part of Chapter Four will briefly discuss three park planning frameworks and how they can be applied to park safety. This discussion will provide a good theoretical basis for an overview of the management plans for Garibaldi Park which will follow.

The Recreation Opportunity Spectrum (ROS) was chosen for analysis due to its systematic incorporation of behavioural information and user experience. Safety as a management issue, is related to behaviour and experience.

The ROS is a land management system for recreation areas. It was

developed from other land management systems, principally the Bureau of Outdoor Recreation Area Classification Plan, the Recreation Opportunity Inventory and Evaluation System, the Recreation Inventory Instructions and the Canada Land Inventory (Brown et al., 1978). The opportunity spectrum concept can be used for broad area planning or more localized forest/unit planning (Brown et al., 1978).

The premise for this planning strategy is the relationship between activities, settings and experiences. Park land is divided into settings based on how urban or rural the particular areas of the park are; each park setting should have management objectives which consider the types of recreation activities, the condition of the setting, the types of experience opportunities and estimates of the amount of recreation to be provided in each of those areas (Brown, 1979). The relationship between activity, setting and experience is very important. For example, an element of risk may be desired and appropriate in a primitive setting but not in a more man-affected setting (Brown et al., 1978). The ROS can include as many opportunity sub-divisions as one wishes; each ROS class contains specifications for appropriate activities, experiences and settings -- these are the opportunities (Brown, 1979). The areal size of an ROS setting varies depending upon local conditions. In general terms primitive settings are greater than or equal to 2023 hectares, semi-primitive settings are greater than or equal to 1012 hectares, and the more urban land areas -- rural roaded natural, semi-urban and modern urban -- have no size standards (Brown, 1979).

In order to delineate these ROS areas one must first conduct an

inventory. The different use levels of each park area are an important part of the delineation process; management strategies will partly be a function of the use that an area receives (Saunders, 1982). In addition to social characteristics of an area -- such as use levels -- physical characteristics and present site management should also be inventoried (Brown, 1979). These socio-physical characteristics can then be overlayed cartographically so that appropriate classification with underlying land uses, can occur (Brown, 1979). Then the suitability of possible activities for that land area class must be determined. One can apply the Canada Land Inventory (CLI) for recreation to determine activity opportunities for an area. To facilitate the inventory and analysis of social and managerial attributes, one must consider the amount of visitor interaction, existing facilities, present site management, visitor impacts and visitor regulations (Brown, 1979). Measurement techniques for the inventory and analysis of both physical resource attributes, and social and managerial attributes need to be developed (Brown et al., 1978). Ranking inventory factors could be used as a measurement technique for inventory and analysis; Chapter Five discusses this methodology in detail.

Scale can have an impact on the classification of settings. For small areas, one needs specific recreation management objectives and information about appropriate and available recreation opportunities (Brown et al., 1978). One can relate physical resource attributes -- for example, river rapids -- to psychological outcomes -- that is, experiences (Brown et al., 1978). To assess attributes properly, one

needs to assess public preferences, of which Driver and Brown (1978, as quoted in Brown, 1979) list four types: 1. activities; 2. environments or settings; 3. types of satisfactions, and 4. subsequent benefits. One must also try to determine negative attributes at the small scale level which detract from the desired experiences (Brown et al., 1978). Clearly, the ROS has made an attempt to include park users' perceptions -- for example, preference studies -- into decision-making; behavioural information is an integral part of the ROS land planning framework.

The Outdoor Recreation Classification System for British Columbia (ORCBC) was chosen for analysis due to its incorporation of biophysical limitations which dealt with natural hazards, and it was designed for British Columbia recreation lands such as Garibaldi Park.

Features are inventoried by this classification system for recreation potential. It had its roots in the Canada Land Inventory (British Columbia, 1982) and does not spatially delineate zones like the ROS. The ORCBC system inventories land features which can be classified as 1. biotic, 2. physical/geographic, 3. water oriented, 4. cultural/historic and 5. miscellaneous. After the inventory has taken place, each feature is assigned a code made up of a group of symbols (British Columbia, 1982).

One advantage of the ORCBC is that it inventories biophysical limitations which are defined as "...an inconvenience or safety hazard (which) exists for the user" (British Columbia, 1982, p.53). Such biophysical limitations can consist of avalanches, failing slopes, or biological hazards such as bears or snakes; climatic factors can also present limitations -- for example, water hazards. This biophysical

information must be combined with all the other inventory information so that an appropriate decision regarding the coding of recreational features can occur (British Columbia, 1982).

There is some user input into this inventory system: the interviews question experienced people about the values of the recreation feature(s) at a particular location are. However, in terms of safety there is no consideration of management; the objective seems to be to identify hazards and their locations, not to manage user safety.

While the ORCBC system does not classify park areas for management purposes, it could be used in the inventory stages of the ROS classification of recreational land areas; this role for the ORCBC system is stated within the manual (British Columbia, 1982) and it is also reiterated by P.J. Dooling in the Faculty of Forestry at the University of British Columbia (as quoted in Williams, 1984). The use of the ORCBC system would be especially useful for outlining hazardous areas within a park which could then be overlayed with other cartographic information in order to come up with optimal decisions regarding the locations of safety management.

The Visitor Activity Management Process (VAMP) was chosen for analysis due to its use of visitor activity profiles which evaluate the needs and wants of users based on their activity (Canada, Environment Canada, Parks, 1986). The safety needs and wants of users can be determined using these visitor activity profiles.

VAMP was designed exclusively for Environment Canada, Parks in order to systematize planning and management for visitors (Canada,

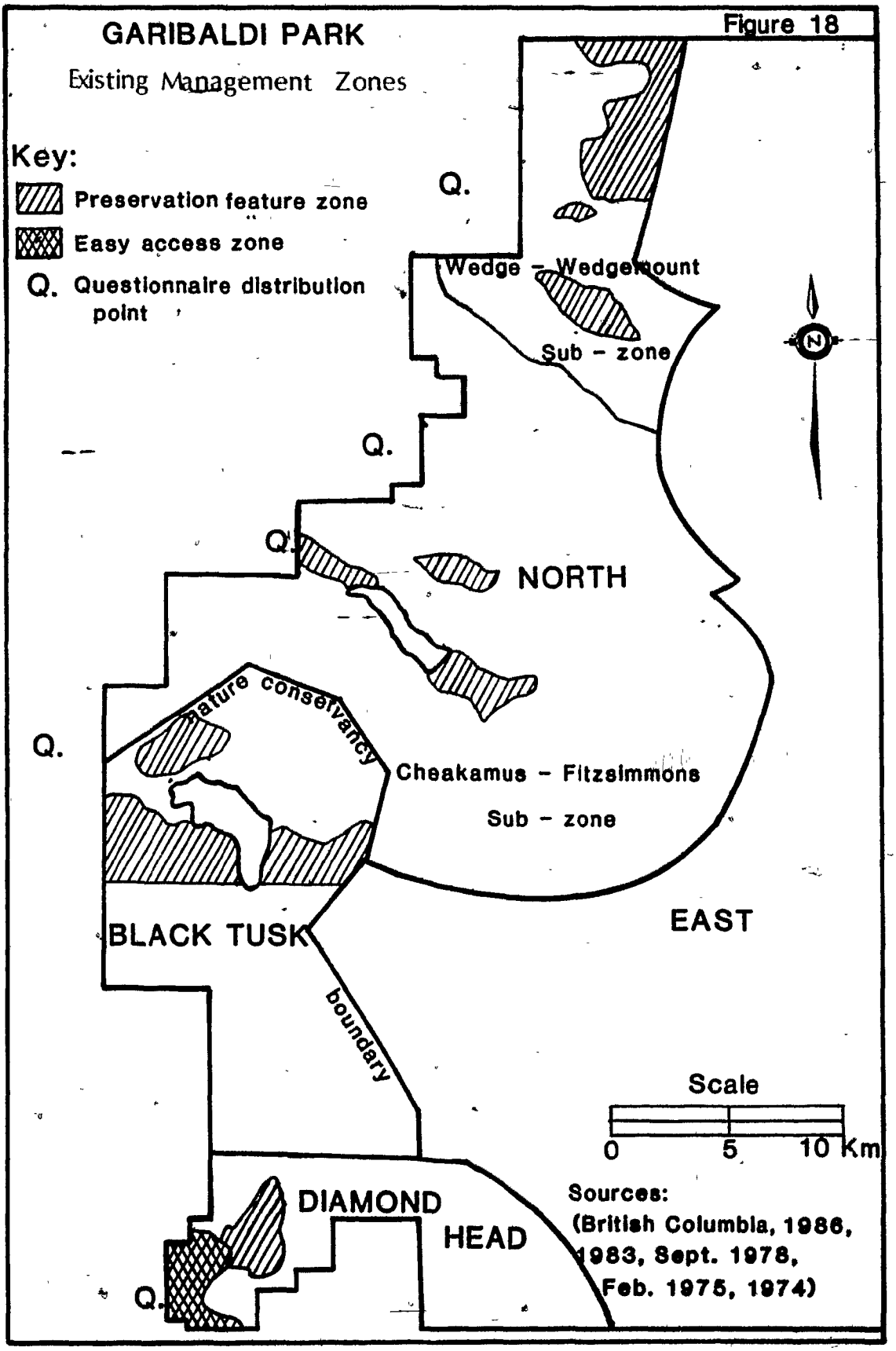
Environment Canada, Parks, 1986). It does not deal directly with experience as does -- for example, the ROS (Payne, Personal Communication, 30 October 1985) -- and therefore it is not behaviourally based. VAMP consists of park service plans related by administrative guidelines -- public safety forms such a plan (Canada, Environment Canada, Parks, 1986). Whereas mapping is not an integral part of VAMP -- as in the ROS -- its disaggregation of visitors based on activity is useful for for safety planning.

4.5 Garibaldi Park Management Plans

Plans do exist for Garibaldi Park (British Columbia, 1983; September 1978; February 1975; 1974). The approach used is AD HOC, which places emphasis on resource evaluation and recreation activities provided. Environmental concerns dominate most of the planning decisions since it is a wilderness park. Throughout, opportunities are considered; however, these are primarily oriented toward activities. Experience is considered in the general sense of providing for the "Wilderness Experience" -- it is not the key concern as in the ROS. The Garibaldi Park zones are based on easy access and primitive access. In addition, there is a nature conservatory zone which is to be kept in as pristine a state as possible. And there is a preservation features zone where unique characteristics of the landscape exist such that people will want to see them; however, protection of the features is emphasized. Management facilities are listed cartographically with symbols; and trails are assigned classification numbers based on their degree of development.

The present planning system covers four areas of the park, each in separate reports. These component sub-plans were produced at different times. The first plan was produced in 1974 for the Diamond Head area; the second was produced in 1975 for the Black Tusk area; the third was produced in 1978 for the northern part of Garibaldi Park; the most recent plan was produced in 1983 for the eastern part of the park (Figure 18). The four plans together cover the entire park; however, the Black Tusk and Diamond Head plans cover smaller areas than the northern and eastern plans and are much more detailed due to higher use levels. These master plans have become outdated due to policy change and will be integrated into a complete master plan by the spring of 1987 (Chin, Personal Communication, 7 January 1987).

The general planning policy for each of the four park areas is as follows. The goal of the Garibaldi-East plan is wildland recreation and conservation. Recreational activities must optimize the "Wilderness Experience;" these acceptable activities are dispersed primitive camping, hiking, mountain climbing, skiing and fishing. Although the goal of the park is to keep this area as wilderness-like as possible, minimal resource modification may have to take place in the future for user safety and to protect the resources (British Columbia, July 1983). The Garibaldi Park - North plan does take in similar wilderness territory as the eastern section of the park; however, the localized high use areas of Wedgemount Lake, Fitzsimmons and Cheakamus Lake necessitate a more diversified plan with more management in the form of primitive access zones and preservation feature zones (British Columbia, September 1978). In this region there


GARIBALDI PARK
Figure 18
Existing Management Zones
Key:
Preservation feature zone
Easy access zone
Q. Questionnaire distribution point
Q.
Wedge – Wedgemount
Sub – zone
Q.
Q.
NORTH
Nature conservancy
Q.
Cheakamus – Fitzsimmons
Sub – zone
EAST
BLACK TUSK
boundary
Scale
0 5 10 Km
DIAMOND
HEAD
Q.
Sources:
(British Columbia, 1986,
1983, Sept. 1978,
Feb. 1975, 1974)

is a diversity of acceptable activities ranging from mountaineering to hiking, canoeing, kayaking, fishing and camping (British Columbia, September 1978). The Black Tusk plan must take into consideration the high use levels that it receives. It is planned by zones which separate management policies for each zone, which include preservation feature zones and a nature conservatory zone. It is designed for primitive access opportunities (it has no easy access zones): walk in sub-alpine camping; viewing; nature study; photography; advanced ski touring; snowshoeing; mountaineering; and hiking (British Columbia, February 1975); mountaineering and related activities are suited for the nature conservatory zones (British Columbia, May 1974). In the Diamond Head area, the acceptable activities for the easy access zone are ski touring, snowshoeing, snow play, hiking, berry picking, viewing, nature study and photography (British Columbia, May 1974). In the primitive access zones alpine tent and shelter camping, mountaineering, exploration, viewing, nature study, photography and fishing are acceptable (British Columbia, May 1974).

In conclusion, the Garibaldi East master plan concerns mostly wildland recreation and a limited range of suitable activities; the Garibaldi North plan provides for somewhat more diversity; the Black Tusk and Diamond Head master plans provide for the most diverse range of activities -- and associated experiences. There are no component plans for safety or other management concerns. However, safety is implied in the plans with the listing of facilities present; and safety is mentioned on occasion -- for example, in the Garibaldi East master plan (British Columbia, July 1983) and in the Diamond Head master plan

(British Columbia, May 1977).

4.6 Treatment Of Safety As A Park Planning Issue

In the previous parts of Chapter Four, site examples of safety planning, the park planning process through which decisions for safety planning are made, and land classification systems for the decision-making of this safety planning were analyzed. This last section of Chapter Four will look at conceptual planning prospects for park safety.

There has been a trend since the mid 1970's to systematize park safety planning. Christiansen (1977) in his Park Planning Handbook, attempted to break down safety planning into general categories ranging from sanitation to physical hazards. He started with fundamental concepts such as the definitions of an accident and an emergency. He was also interested in the pre-design phase of safety planning -- for example, considering what and where activities would take place in the park. While his comments were primarily directed toward urban-type parks, his systems approach has several applications for wilderness parks.

In 1985, Christiansen furthered his park safety planning approach. In his paper entitled "Safety is No Accident," Christiansen elaborated further the need to abate hazards before they become out of hand, while taking into consideration the use that hazardous areas receive and the risk of accidents occurring in those areas. He then considered possible adjustments that could be made in light of the hazards and the possible consequences. Christiansen also recommended that safety

facility locations such as emergency telephones and first-aid stations be represented cartographically. In general, however, his main thrust seemed to be the need for constant upgrading of hazard ratings in park, so that adjustments could be optimal (Christiansen, 1985).

Gold (1983) like Christiansen (1985, 1977) has advocated the need to systematize park safety planning; however, Gold also points out that behavioural input is a necessity. By anticipating "the emotional and perceptual maturity" of park users, the location of safety needs can be more accurately assessed (Gold, 1983, p.8). Unfortunately, Gold did not go far enough to say that actual behavioural data should be collected. Gold's systematic safety planning strategy takes the following order: 1) site planning; 2) hazard removal; 3) information and education; 4) regulations; and 5) evaluation. While his approach is directed toward the site planning of playgrounds, it also has possible applications to the wilderness environment in terms of its systematic process.

4.7 Conclusion

In general terms, users' perceptions have been incorporated into park management, but with some limitations. Most public input has been opinions regarding general management issues. While opinion is an important factor, the need for facilities, services and regulations has been neglected. User density and accident statistics have been used; however, perception information has not. The ROS is experienced based and therefore safety planning using this classification system would indicate how much safety planning would affect the desired experiences

of park users. VAMP's visitor activity profiles can be used to classify park users' safety perceptions so that the most accident prone activity group can be identified.

CHAPTER FIVE

SCENARIOS FOR INCORPORATING HAZARD PERCEPTION INFORMATION INTO SAFETY PLANNING

The main goal of Chapter Four was to evaluate park management in terms of incorporating users' perceptions. First, examples of park safety facilities, services and regulations were given. Second, the park planning process was described then evaluated for incorporating users' input. Third, land classification systems through which safety decisions are or could be implemented were briefly discussed. Finally, conceptual planning prospects for safety were evaluated. In Chapter Five the perception results from Chapter Three are combined with the planning/management knowledge from Chapter Four to demonstrate a new approach for creating safety plans in existing or new parks, and to rank park areas based on safety management needs.

5.1 Incorporating Perception Information Into Park Hazard Evaluation

Evaluating park hazards can make use of objective statistics dealing with the hazard phenomena as well as user behaviour information. The first part of this chapter will focus on utilizing hazard perception maps and other behavioural information to aid safety planning in parks.

As objective as natural hazard evaluation and mapping may appear at the outset, there is a certain degree of subjectiveness involved. The kinds of hazards which are evaluated or mapped will be the result of perceiving those hazards as problems. For example, the avalanche mapping which was undertaken in Cypress Provincial Park, British

Columbia, resulted from the perception that avalanches in the downhill ski area could be a potential problem (British Columbia, April 1978). Moreover, Christiansen (1977) in his Park Planning Handbook, lists certain hazards which one should be aware of when planning a park. Likewise, Gold (1983) lists particular hazards which must be mitigated to provide a safe environment for playgrounds. While these hazards may be assessed objectively, as through cartographic means, the decision to evaluate those certain hazards is a subjective one. In a park environment, therefore, the decision to evaluate hazards is a function of the location the activities, the season and the management policy of the park administration.

A practical strategy is to compare a hazard perception map with a map of accident locations and intensities. If accidents are occurring where there are no perceived hazards, then one can use the qualitative comments to ascertain why accidents are occurring. If there are perceived hazards where accidents have not occurred, then there may have been a recent change in the physical or social environment -- for example, a new hiking trail leading to a glacier -- which has increased the hazardousness of the area and has increased the potential for accidents; or park users may have made personal adjustments to the hazards -- for example, as with mountaineers in the Wedgemount Lake area. In summary, these perception data can be used to help determine why accidents are occurring in non-hazardous environments and what the probability is of accidents occurring in hazardous areas.

Planning in terms of safety has always been based on managers' perceptions. However, users who view the park as hazardous when park

managers do not, may initiate research into certain areas of the park to determine if safety could and/or should be improved; these are areas where there are no natural hazards present. There may be some factors unknown to the park manager which the park users reveal about the hazardousness of a certain area. As well, when a park user assesses an area to be hazardous, it is a holistic decision, taking into consideration both objective and subjective elements. This hazard assessment will be affected by the experience the user has had in the park and in his or her activity. When hazards are mapped objectively, this subjective element is very difficult to include such that one map with all criteria used to classify hazardous areas is produced.

The other behavioural information, which is derived from asking park users non-spatial questions, can be combined with the cartographic perception information so that the park manager has a better idea of how park users personally cope with hazards and if park users actually want increased safety management. If users are well prepared to deal with hazards and they do not favour any park management action, then the park manager would be wise to do nothing. On the other hand, in areas which are potentially dangerous due to physical hazards, although park users do not perceive them as hazardous and do not take precautions and would favour increased safety management, user perceptions may cause enough concern to try either, 1. change user behaviour so that the user becomes more safety conscious or 2. alter the physical environment so that it becomes less hazardous.

5.2 Incorporating Hazard Perceptions And User Behaviour Information Into Safety Planning Scenarios

The goals and objectives of park managers with regard to safety management will vary from park to park. Some managers may want to establish a final site safety plan; others may simply want an indication on a larger areal scale, where safety management should be a priority. In this section three planning scenarios which utilize users' perceptions will be discussed. The first two involve creating an actual safety plan. The third scenario involves ranking park areas according to safety management needs; Garibaldi Park is used as a case study.

New Safety Plans For Existing Parks

Hazard perception information can be incorporated into a new safety plan for an existing park. Hazards can be inventoried with perception maps by using the zoning scheme that the park already utilizes.

One must also assess the demand and need for safety; interviews and/or questionnaires can provide this information. One can ask people such questions pertaining to where they went in the park, their safety concerns, experience, precautions that they took and their desire for safety management. Such information provides insight into the probability of coming into contact with hazards, how park users deal with hazards and whether the existence of hazards enhances their recreation experience. As well, questionnaires and/or interviews can ask park users where they think hazards occur. This helps park

planners by pointing out areas where there are concerns for hazards and areas of misperceived hazards.

By using the Outdoor Recreation Classification System for British Columbia (ORCBC), one can make sub-zones based on the biophysical limitations (hazards) found throughout the park (British Columbia, 1982). These zones can then be used to help evaluate perceived hazardous areas. The landscape elements classified as perceived hazards can then be evaluated with an ORCBC biophysical limitation inventory to determine if the areas are naturally hazardous.

This perception and behaviour information should be used as an inventory tool to complement other social management commitments in the particular park. In accordance with park regulations and the type of land management system used to plan and manage the park, action can be taken to improve safety. The opportunities will be changed based on the managerial criteria of user demand or need for safety.

Newly Created Parks

Newly created parks can also use perception and behavioural information when planning. Significant hazard perception and other behavioural trends from the Garibaldi Park study can be incorporated into the inventory analyses for other parks' plans. Similar perception and behaviour data from other studies can be added to the Garibaldi Park data to provide a visitor activity profile data base. One must operationalize this information with other management factors in the new park so that an appropriate safety plan is constructed.

Ranking Areas For Needed Safety Management

A synopsis of this methodology will be given then it will be applied to the Garibaldi Park case study.

Land use planning has used quantification to ease management decision-making in many ways. For example, in Vermont, natural area classification and evaluation, aesthetics planning, and recreation site evaluation have relied on rating areas numerically and/or ranking them (Sargent, 1976). McHarg's (n.d.) "Natural Systems Inventory" ranks environmental factors in relation to specific land uses (Lang and Armour, 1980). Ranking landscape features has also been used to produce "recreation environment" maps (Gittins, 1974).

Hazard perception information can also assist ranking areas for safety management. The goal is to determine where safety management should be directed in the park.

Ranking areas for needed safety management involves dividing the park into areas. These areas can then be evaluated for safety needs by ranking them based on the following factors dealing with perception and other park user characteristics:

1) number and severity of accidents
2) number of perceived hazards
3) number of precautions taken
4) number and intensity of safety concerns
5) amount of park user experience
6) amount of risk motivation
7) park user attitudes toward safety management

One must operationalize these factors into a decision-making framework. Each factor is ranked using different criteria. The factor values for each area are summed. The area with the lowest value is a

priority area.

One must not confuse the use of ranking in planning decision-making with statistical testing. Analysis of variance indicates whether or not grouped differences are statistically significant (Hammond and McCullagh, 1980; Siegal, 1956). Whereas such information would be useful for planners, I was not able to apply these variance tests without changing the ranking methodology (Hammond and McCullagh, 1980; Siegal, 1956).

The goal of the ranking scheme is to ease location decision-making for management. Although theoretically important to the premise of the decision, statistical tests on the ranked data do not directly ease location decision-making. Sargent (1976), for example, emphasizes that the natural area classification system he describes is only for planning purposes. Moreover, Gittins (1974) emphasizes that his recreation area ranking scheme is subjective, but provides a base map for management, "preferable to the piecemeal and often haphazard development" of recreation planning (Gittins, 1974, p.141).

Where cost is a constraint to safety planning -- no park has an unlimited budget -- one can invest safety into areas where it is absolutely needed first. Once the priority zone is identified, it can be analyzed and inventoried more thoroughly.

This detailed inventory and analysis stage involves comparing the ranked values for each of the seven factors. In many cases the reasons why an area is a safety management priority can be determined from the ranks of the different safety factor values. For example, in an area where there are many accidents, but few safety concerns, adjustments

and/or perceived hazardous areas, there is an indication that the area is not perceived as hazardously as it is in reality -- there is a higher probability of accidents. Therefore, either the physical environment or the psycho-social environment must be altered (for example, inclusion of services and/or regulations, which may exclude visitors from the park). On the other hand, if perceived hazards are ranked higher than accidents, the particular zone is then perceived to be more hazardous than it is objectively. Therefore, park managers must analyze the presence of subjective (human) hazards.

5.3 Applications In Garibaldi Park

The goal of this study is to operationalize perceptions and other users' characteristics into a decision-making framework in order to set priority park areas for safety management. It is hypothesized that this perceptual input will optimize such location decision-making where normally accident statistics are used alone. The seven ranking factors listed previously try to exemplify differences between the different visitor activity profiles. Such differences are important to note -- for example, mountaineers generally take more precautions than hikers, and mountaineers generally want less safety management than hikers. The objective is to allocate safety management where needed while maximizing the users' desired experiences.

A second objective could be to inventory all hazards. This approach is similar to Hewitt and Burton's (1971) "All Hazards at a Place" strategy. As mentioned above, these perceptions should be analyzed to determine whether natural or human hazards are involved.

Using the Chapter Three data analysis results, the circled hazard perception areas could be correlated with park user activity profiles. By combining accident location and intensity maps with hazard perception maps, one could determine where hazardous areas exist. Policy decisions could be made for each of these hazardous areas. These policies could be implemented spatially using the Garibaldi Park management plans described in Chapter Four.

Application Of Present Garibaldi Park Management Plans For Ranking Safety Management Areas

The present planning reports as discussed in Chapter Four can be used to rank safety management areas. Each report lists acceptable activities for the particular park region, present and future management, and other resource uses presently underway or planned for the future. The reports do not really specify experience; however, the questionnaire results could provide such data. Because the Diamond Head and Black Tusk plans coincide with two of the source locations of questionnaire results, the questionnaire responses from the two areas could be easily matched with their respective plans. The questionnaire results from Cheakamus Lake, Fitzsimmons and Wedgemount Lake would be compatible with the Garibaldi North master plan. Because no questionnaires were given out to users of the eastern part of the park, there will be no attempt to rank safety needs in this part of Garibaldi Park.

The seven ranking factors mentioned previously are used to inventory safety in Garibaldi Park. These factors will be discussed

briefly in terms of data collection and the ranking criteria. At the end of each ranking factor explanation, the ranked value will be given.

5.4 Safety Management Inventory

FACTOR 1) Number and Severity of Garibaldi Park Accidents

First, the park areas are ranked from 1 to N using "largest number of accidents" as a criterion. Second, the park areas are ranked from 1 to N using "most severe" accidents as a criterion (Table 13). The two ranked values are added for each area. To make accident statistics relative, they are multiplied by the user density rank, derived from park statistics (Table 14) covering the period of June to September (1=lowest; 5=highest). Due to the limitations of the accident and user density statistics, only ordinal measures, that is ranking, can be used. The areas are ranked from 1 to N using "the lowest summed value" as a criterion. The following is the ranked order:

1)Wedgemount Lake
2)Fitzsimmons
3)Black Tusk
4)Diamond Head
5)Cheakamus

	ACCIDENT NUMBER RANKING		ACCIDENT SEVERITY RANKING		SUB-TOTAL		USER DENSITY RANKING		TOTAL
Wedgemount	(5	+	1	=	6)	X	1	=	6
Fitzsimmons	(3	+	4	=	7)	X	2	=	14
Cheakamus	(4	+	5	=	9)	X	3	=	27
Black Tusk	(1	+	2	=	3)	X	5	=	15
Diamond Head	(2	+	3	=	5)	X	4	=	20

TABLE 13

NUMBER AND SEVERITY OF GARIBALDI PARK ACCIDENTS

LOCATION		EXTENT		CAUSE	
Black Tusk	25	serious*	3	mountains	8
		major+	11	travel & trails	13
		minor@	11	camping area	2
Diamond Head	12	serious	2	mountains	nil
		major	6	travel & trails	12
		minor	4	camping	nil
Cheakamus	3	serious	1	mountains	nil
		major	nil	travel & trails	1
		minor	2	camping area	2

source:
(British Columbia. Ministry of Environment and Parks, 6 March 1987. Garibaldi/Sunshine Coast District)

Fitzsimmons	4	serious	1	mountain	nil
		major	nil	travel & trails	3
		minor	3	camping area	nil
Wedgemount	4	serious	4	mountains	4
		major	nil	travel & trails	nil
		minor	nil	camping area	nil

source:
(Cathers, D., 15 January 1987, Personal Communication)

* required some sort of assisted evacuation from park
+ required further medical treatment outside the park but were able to leave the park unassisted
@ only onsite medical treatment required

TABLE 14

GARIBALDI PARK DAY AND NIGHT USE FROM JUNE TO SEPTEMBER, 1980 TO 1985 (VALUES ARE IN PARTIES OF 3 VISITORS)

	1980	1981	1982	1983	1984	1985	AVERAGE 1983-1985
WEDGEMOUNT	----	----	----	----	----	----	1100e
FITZSIMMONS	----	----	----	412+	920+	1610	1610e
CHEAKAMUS	----	----	----	1311	2759	2181	2084
BLACK TUSK	----	----	----	5258	5787	6912	5986
DIAMOND HEAD	----	----	----	3006	1730	2215	2317
PARK TOTAL	9388*	8669*	----	9987*	11196*	13951*	13097

\+ STATISTICS DO NOT COVER ENTIRE JUNE TO SEPTEMBER PERIOD
* ANNUAL PARK TOTAL VARIATIONS ARE DUE TO DIFFERENT SAMPLING METHODS
e ROUGH ESTIMATES BASED ON AUTOMOBILE NUMBERS, TRAIL REGISTER ENTRIES AND DISCUSSIONS WITH PARK STAFF

Source: (British Columbia. Ministry of Lands, Parks and Housing. February, 1981, 1982, 1984, 1985, 1986. Park Data Handbook)

FACTOR 2) Number of Perceived Hazards

The hazard perception maps from Chapter Three for all activities are correlated with each of the five park areas. Only the perceived hazards within the park boundaries and within reasonable* access from each of the the five questionnaire distribution points are included (Figures 6 to 14).

In the Wedgemount Lake area, only the hazards perceived north of Wedge Creek would be considered. In the Fitzsimmons area, all perceived hazards north of the 1250 metre contour above Cheakamus Lake would be included. Those perceived hazards to the south of this 1250 metre contour would be included on the Cheakamus perception map. All the perceived hazardous areas in the Garibaldi Lake area would be included as would the perceived hazardous areas in the Diamond Head area.

The percentage categories are ranked from 1 to N with the 1 to 15 percent range assigned 1. The total number of cells in each percentage category are multiplied by the rank of that category (this was done previously with a grid overlay). The values for each of the five park areas are summed, then ranked as a criterion. The values for each area are as follows: Wedgemount Lake (539), Fitzsimmons (1018), Cheakamus (115), Black Tusk (929), and Diamond Head (375). The following is the ranked order:

1)Fitzsimmons
2)Black Tusk
3)Wedgemount Lake
4)Diamond Head
5)Cheakamus Lake

* subjectively drawn boundaries indicate probable access limit from the questionnaire distribution point

FACTOR 3) Number of Precautions Taken

Using question #12 responses as a data source, the percentage of respondents in each area that took the listed precautions, and those that took additional precautions, are summed. In each area the percentage of respondents who took no particular precautions is subtracted from the above value (Appendix 2.1). The park areas are ranked from 1 to N using "the lowest cumulative percentage of precautions taken" as a criterion. The following is the ranked order:

1)Cheakamus Lake
2)Diamond Head
3)Black Tusk
4)Fitzsimmons
5)Wedgemount Lake

FACTOR 4) Number and Intensity of Safety Concerns

Using question #10 responses as a data source, the number and intensity of safety concerns between park areas can be evaluated. For each park area the percentage of respondents who had a "large amount" or "extreme amount" of concern is summed for the concerns listed (Appendix 2.2). The areas are ranked from 1 to N using "the highest cumulative percent values" as a criterion. The following is the ranked order:

1)Fitzsimmons
2)Wedgemount Lake
3)Black Tusk
4)Cheakamus Lake
5)Diamond Head

FACTOR 5) Amount of Park User Experience

First, using question #2 responses as a data source, experience in activity is evaluated by calculating for each area the percentage of people with less than 1 year's experience. To further evaluate activity experience, question #13 responses are used; the percentage of respondents who had not been lost or involved in a wilderness recreation accident is calculated for each area. Second, using question #5 responses, experience in the park is evaluated by clustering the percentage of people in each park area who had not done their trip before. Using question #15 responses, experience in the park is further evaluated by listing the percentage of people who had never been to the park before. These four experience percentage values are then tallied for each park area (Appendix 2.3). The areas are ranked from 1 to N in terms of the highest percentage values. The following is the ranked order:

1)Black Tusk
2)Fitzsimmons
3)Cheakamus Lake
4)Wedgemount Lake
5)Diamond Head

FACTOR 6) Amount of Risk Motivation

Using question #6 responses, the percentage of respondents in each park area with a motivation of challenge and risk is calculated (Appendix 2.4). The park areas are ranked from 1 to N using "the lowest challenge and risk" percentage as a criterion. The following is the ranked order:

2)Fitzsimmons
2)Cheakamus Lake
2)Diamond Head
4)Black Tusk
5)Wedgemount Lake

FACTOR 7) Park User Attitudes Toward Safety Management

Using question #17 responses, attitudes toward safety management are evaluated by summing in each area, the percentage of respondents who "support" or "strongly support" safety management, less the percentage of respondents who "oppose" or "strongly oppose" safety management (Appendix 2.5). The park areas are ranked from 1 to N using "the highest attitude (support)" percentage as a criterion. The following is the ranked order:

1)Cheakamus Lake
2)Fitzsimmons
3)Black Tusk
4)Diamond Head
5)Wedgemount Lake

Operationalizing the Factor Ranking into Areal Decision-Making

The following table shows the ranked positions of the five Garibaldi Park areas with regard to the seven management factors.

#1 ACCIDENTS	#2 HAZARDS	#3 PRECAUTIONS	#4 CONCERNS
1) Wedgemount	1) Fitzsimmons	1) Cheakamus	1) Fitzsimmons
2) Fitzsimmons	2) Black Tusk	2) Diamond Head	2) Wedgemount
3) Black Tusk	3) Wedgemount	3) Black Tusk	3) Black Tusk
4) Diamond Head	4) Diamond Head	4) Fitzsimmons	4) Cheakamus
5) Cheakamus	5) Cheakamus	5) Wedgemount	5) Diamond Head

#5 EXPERIENCE	#6 RISK	#7 ATTITUDES
1) Black Tusk	2) Fitzsimmons	1) Cheakamus
2) Fitzsimmons	2) Cheakamus	2) Fitzsimmons
3) Cheakamus	2) Diamond Head	3) Black Tusk
4) Wedgemount	4) Black Tusk	4) Diamond Head
5) Diamond Head	5) Wedgemount	5) Wedgemount

TOTAL RANK SCORES FOR THE FIVE PARK AREAS —

Fitzsimmons = 14*
Black Tusk = 19
Cheakamus = 21
Wedgemount = 25
Diamond Head = 26

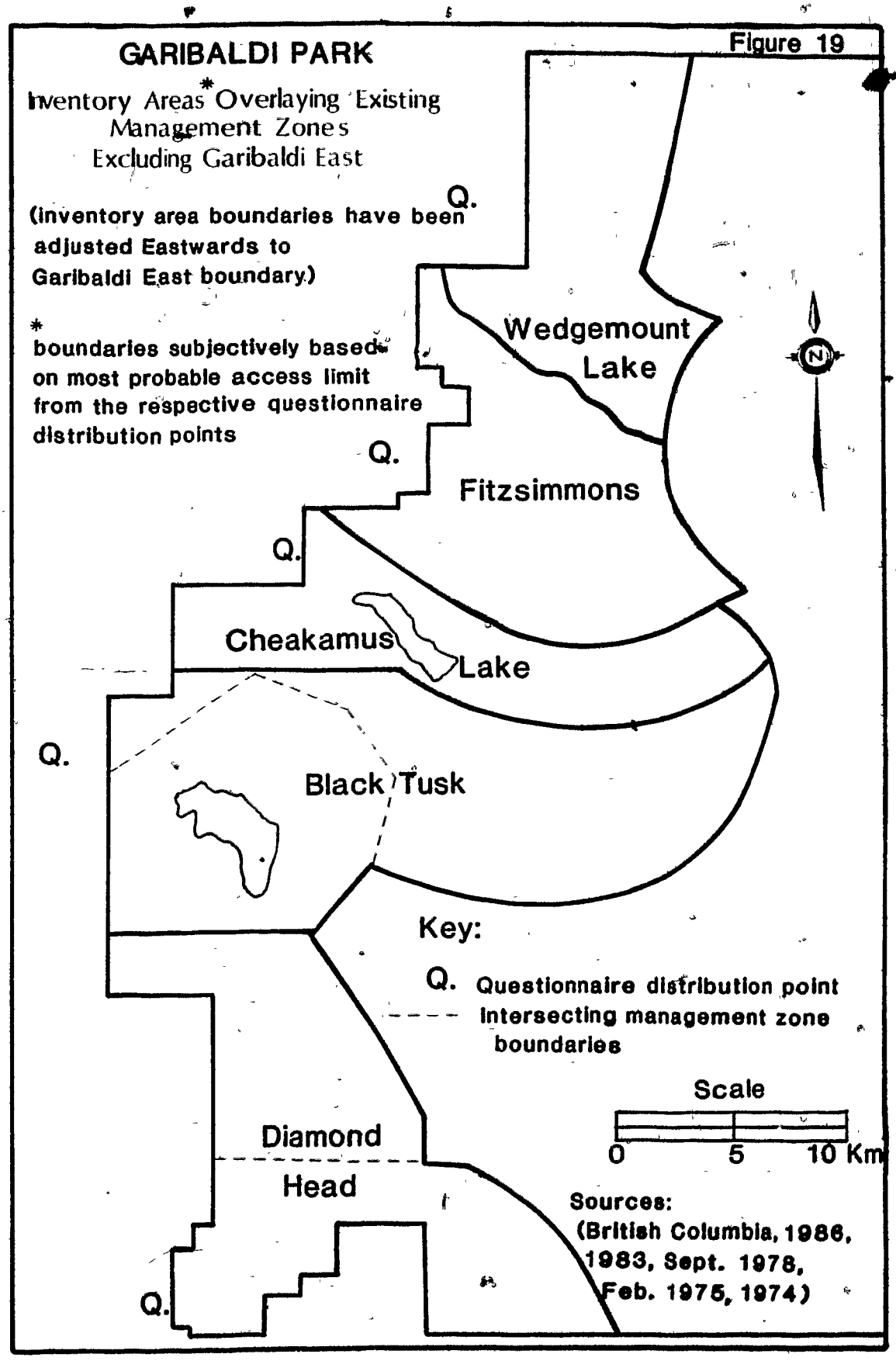
* Priority area

In the Garibaldi Park case study the Fitzsimmons area was ranked as the number one priority area. If two areas have a tied rank, one can subjectively weight certain factors which are more critical in the objectives of the park managers -- for example, precautions taken. If more factors were added to the ranking scheme, there would be less chance of tied ranks.

The final step involves overlaying the park areas on top of the management zones (Figure 19). The management zones will divide the areas; hence different management policies will guide decisions in the same priority area. If one is able to take into consideration the different management zones before ranking areas for safety planning, then the management zones and the priority areas will closely coincide.

5.5 Incorporation Of The ROS Into Safety Planning Using Perception Information

The ROS can be incorporated into all of the three aforementioned safety planning strategies. It can be applied to use as an aid for making decisions about where safety facilities, services and regulations should be allocated (long-term safety plan); and it can be used to set priority areas for safety management (short-term safety reconnaissance). The ROS classifies land areas on a spectrum from


GARIBALDI PARK
Figure 19
Inventory Areas* Overlaying Existing Management Zones Excluding Garibaldi East
(inventory area boundaries have been adjusted Eastwards to Garibaldi East boundary.)
* boundaries subjectively based on most probable access limit from the respective questionnaire distribution points
Q.
Wedgemount Lake
N
Fitzsimmons
Cheakamus Lake
Black Tusk
Key:
Q. Questionnaire distribution point
Intersecting management zone boundaries
Scale
0 5 10 Km
Diamond Head
Sources:
(British Columbia, 1986, 1983, Sept. 1978, Feb. 1975, 1974)

urban to wilderness. For example, most of Garibaldi Park is wilderness, classified as primitive in the ROS system. Near the trail entrances and around the Taylor Meadows and Garibaldi Lake areas, there is evidence of a semi-primitive non-motorized and semi-primitive motorized environments (aircraft landing on Garibaldi Lake).

The ROS can be used to develop a new safety plan for an existing park. The plan implies safety by allowing certain activities, facilities, services and regulations in each setting opportunity.

By dividing a park into ROS zones, one has a spatial framework on which to inventory safety. First, the park is divided into zones based on physical, social and managerial criteria (Clark and Stankey, 1979). In policy, each zone is allowed certain activities. Each ROS zone also supports different possible experiences and what people's motivations are for going to certain park areas; risk-taking can be one experience which someone desires. If a park already has a ROS plan, then only managerial setting and physical setting maps have to be produced for safety planning purposes.

As with any management system, the perception information should be used as an inventory tool along with user density, desired experiences and other management information, which can then be overlapped to produce a ROS inventory map for the park. In accordance to park policy and where there is a need and/or demand for more safety, the physical and/or psycho-social environment may be changed.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

The goal of this study is to improve park safety planning by incorporating the environmental perceptions of the various user groups.

There are various ways for incorporating park users' perceptions into safety planning:

1) As a key component of an existing master plan for a park.
2) As an addition to a behavioural data base for the development of safety plans for newly created parks.
3) As an aid to rank areas for safety management using existing park management plans -- and to show how it could be done in an actual park. Case study example was Garibaldi Park, British Columbia.
4) As a component with the above three planning scenarios, using the ROS.

I have tried to show that this could both improve park users' experiences and ease managements' problems.

Garibaldi Park users exhibited the following characteristics, much of which may be representative of other parks too. First, nearly all respondents took some sort of precautions. Second, few people were motivated by risk as a recreation experience. Third, the majority of people had never done the exact trip before. Fourth, the least experienced users were in the Black Tusk area. Fifth, in contrast to being inexperienced in this particular park, most respondents claimed to be experienced in their activity, regardless of park area. Sixth, most people had not been involved in a wilderness recreation accident; therefore, respondents must have learned to adjust to park hazards in some other way -- experience does not seem to be a key factor, unlike the situation revealed on floodplains. Seventh, the most adjustments to hazards were taken in the Wedgemount Lake area, where the majority

of users took flashlights and at least one additional precaution, whereas these two precautions were not taken in the four other park areas. Eighth, the anticipated length of trip may have had an impact on certain precautions taken -- for example, taking a flashlight; flashlights were not taken as a precaution where most of the people were only going for a daytime hike.

Therefore, in agreement with the theory developed by Burton, Kates and White (1968), there appears to be a threshold of perceived hazardousness above which precautions are taken. Whereas on the floodplain this adjustment process was regulated by flood frequency, in a mountain wilderness park the adjustments appear to be regulated by the frequency of hazards encountered or expected.

Finally, most people were supportive of park management which dealt with safety; there was no spatial variation in the locations of responses; people were least favourable to enforced safety regulations and mandatory registration.

Most visitors to Garibaldi Park were hikers. There were some mountaineers, who were concentrated in the Wedgemount Lake area. Visitors involved in canoeing and other water activities accounted for about 4 percent of the total park sample. Generally, the mountaineers were more prepared for safety than the other visitor activity groups; they were also less supportive of safety management, especially enforced safety regulations and mandatory sign-in/sign-out procedures. In the Wedgemount Lake area, the mountaineers tended to perceive the higher parts of the Wedgemount Glacier as hazardous, whereas hikers perceived the lower parts of the glacier closest to the Wedgemount Lake

cabin as most hazardous. The park users most at risk were inexperienced hikers who went up the Black Tusk, yet did not perceive their trip to be hazardous.

The Garibaldi Park case study provided an abundance of perception information which can be incorporated into safety planning strategies. Unfortunately, however, park users' perceptions have not been used formally in the past when planning for safety; park managers have relied too much on their own intuition and hindsight. In newly created parks the location of safety management is determined by park managers' perceptions, which may be shaped by public input; however, through incorporating park users' perceptions in a more objective methodology, one can improve the quality of these decisions. For the most part, however, this location-decision making is based on past park statistics. There is too large a price to pay if serious injuries or deaths occur before action is taken.

The three safety planning scenarios described can be applied to other wilderness parks. The first scenario inventories hazards using perception maps and existing zoning schemes. The second scenario incorporates hazard perception trends which, even though not statistically testable, are prominent enough to apply to safety plans in new parks which have similar physical and psycho-social characteristics to Garibaldi's. There is the underlying assumption that the Garibaldi results, which were not statistically valid due to small sample sizes, can be used as a geographical analogue as Hewitt and Burton (1971) have outlined.

The third scenario identifies and ranks park areas needing safety

management; Garibaldi Park was used as a case study. This areal planning process, which considers ranking management factors, including hazard perception, can be applied to other wilderness parks.

If the Recreation Opportunity Spectrum (ROS) is used in the above three scenarios then the relationship between setting, activity and experience becomes explicit so that, for example, fencing the sides of mountain trails at the expense of most users' desired experiences does not occur. Furthermore, the ROS zones provide a convenient means to inventory and recognize priorities in safety needs.

Social research -- such as in this park study -- requires commitment and staffing: money for questionnaires, people to implement them, and time to obtain the information from the park users. The co-operation of park users must also be secured for the questionnaire research to be successful. However, students could be encouraged to do much of this research, and questionnaires could be supplemented by observations.

Results of the Garibaldi Park case study theoretically apply only to Garibaldi Park during the survey time span in August 1986. It is an assumption that the questionnaire results apply to the entire summer season and future years' summer seasons. That Thorsell's 1971 questionnaire results were similar to this 1986 study lends support to the hope that this study's findings are relatively accurate and representative.

With regard to the questionnaire itself, some people misinterpreted the questions, and about 8 percent of respondents kept the attached questionnaire maps, which had the questionnaire code on

the back. Thus, it was difficult determining which park area those questionnaires were from and when they were filled out. However, this finding leads to the recommendation that maps should be made more available in Garibaldi Park. For management purposes, the map hazard perception question (#19) should have been changed to ask people where they think there is a need for safety improvement, or visitors should have been asked to outline hazards along the route that they took.

Problems exist utilizing hazard perception mapping. First, the response rate was much lower than with the other questions. Many people felt that they were not familiar enough with the park to outline hazardous areas. Second, it was sometimes necessary to subjectively close some of the circles. Third, some people drew intersecting circles; these were interpreted as one whole circle in order to simplify the response pattern. Fourth, circled roads, highways or other man-made structures outside the park had to be eliminated. Fifth, some people probably could not understand the contour maps, and therefore, did not answer. Finally, it was difficult to differentiate hazard perception results due to personal experience in Garibaldi Park from those attributed to cognizance learned outside of the park.

Some problems occurred in the areal safety ranking scenario. The accident data used in the ranking scheme was not consistent. The data base from the B.C. Parks Branch was for a three year period; data from the Whistler Search and Rescue covered a 10 year period in the case of Wedgemount Lake. The Fitzsimmons accidents are, except for one, all Search and Rescue incidents involving lost or overdue hikers; they were rated minor in intensity. The data from the Diamond Head area involved

winter as well as summer accidents; therefore a disproportionate number of accidents should have occurred in the Diamond Head area. Clearly, the difficulty in obtaining consistent accident data exemplifies the need to use perception information to make better safety management location decisions.

It was time consuming counting up the hazard perception map grid cells. The Wedgemount Lake and Fitzsimmons-Cheakamus maps overlapped; therefore it was a subjective decision to delineate overlapping perceived hazardous areas.

The ranking methodology factors may have to be changed for other parks. For example, activity was dominated by hiking in Garibaldi Park; however, in other parks the different activity groups may be more equally represented and therefore, activities would have to be ranked based on their hazardousness.

There needs to be an increased interdisciplinary approach to park safety. I have concentrated on a geographic approach enhanced by parks and recreation literature dealing with visitor management.

In the future, data bases need to be developed which will model park safety needs based on the setting, the visitor's activities and the visitor's desired experiences.

In particular, further research needs to be aimed at visitor activity profiles, the different safety needs between different activities and within the same activities. The location of these visitor activity profiles (settings) would aid location decision-making of safety facilities, services and regulations. The correlation between visitor activity profiles and recreation setting needs to be

investigated further.

Potentially, one could retrieve visitor activity profile safety information for a desired setting from data base softwear.

In the meantime existing visitor data needs to be collected and classified in a standardized format so that it can be compiled easily into a data base. Such research could be as simple as asking park users what safety gear they take with them. However, the establishment of a standard research paradigm would make study results more useful to park planners. As a corollary, standardized questionnaires need to be developed so that they can be complemented on the local park level, and further work should be done on the relationship between ranking location decision alternatives and the statistical validity of ranked criteria used in decision-making frameworks.

Park safety is an important social science problem. We need to go beyond an actuarial approach and use environmental perception information to plan park safety for the future, not for the past.

Appendix 1. Additional Information For Chapter Three

Appendix 1.1 Wilderness Recreation Safety Survey

(Please answer on the lines provided or put an "X" in the boxes, as appropriate)

1. What major activity were you doing in Garibaldi Park during your trip?_____

2. How much experience do you have in the activity described in question 1? Less than 1 year ( ); Between 1 and 5 years ( ); Between 6 and 10 years ( ); More than 10 years ( )

3. Roughly how long was your visit to Garibaldi Park? Less than 1 hour ( ); Half day ( ); 1 day ( ); 2 days ( ); More than 2 days ( )

4. What place(s) did you go to?_____

5. Have you done this trip before? Yes ( ); No ( )

6. What was your main motivation for coming to Garibaldi Park? (Please mark only one.) Exercise ( ); Challenge and risk ( ); Competition ( ); Escape ( ); Solitude ( ); Spiritual rejuvenation ( ); Relaxation ( ); Socialization ( ); Education ( ); Other (please specify):

_____

7. What size group were you travelling with during your trip? Solo ( ); Two ( ); Three ( ); Four ( ); Five or more ( )

8. Have you taken any outdoor-related courses in the past five years? (Mark as many as apply.) First-aid ( ); C.P.R. ( ); Survival ( ); Avalanche ( ); Have taken no courses in the past 5 years ( ); Other (please specify:)_____

9. What do you think is the most common type of recreation accident or mishap in a wilderness environment like that of Garibaldi Park?

_____

What do you think is the main cause of this type of recreation accident or mishap?_____

10. How much concern did you have for the following hazards during your trip?

	None	Some	Moderate Amount	Large Amount	Extreme Amount
Exposure	( )	( )	( )	( )	( )
Steep areas	( )	( )	( )	( )	( )
Rough trail surfaces	( )	( )	( )	( )	( )
Bears	( )	( )	( )	( )	( )
Sunburn	( )	( )	( )	( )	( )
Foul weather	( )	( )	( )	( )	( )
Becoming lost	( )	( )	( )	( )	( )
Exhaustion	( )	( )	( )	( )	( )

Were you concerned about anything else which might have affected your safety? (if yes, please specify:)_____

11. If not properly prepared, how much danger do you feel is involved in the trip that you took? None ( ); Some ( ); Moderate amount ( ); Large amount ( ); Extreme amount ( )

12. What precautions did you personally take to ensure your safety on this trip? (Mark as many as apply.)
Checked weather report ( ); Left message telling where you were going ( ); Brought first-aid kit ( ); Brought flashlight ( ); Brought map of area ( ); Brought extra food ( ); Brought extra clothing ( ); Wore hiking boots ( ); No particular precautions taken ( ); Other (please specify):_____

13. Have you ever been lost or involved in a wilderness recreation accident? Yes ( ); No ( )

14. What has been your main source of wilderness safety information?

15. How many times have you been to Garibaldi Park before? None ( ); 1 ( ); 2-5 ( ); 6-10 ( ); 11-20 ( ); 21 or more ( )
Have you been to more than one area of the park? Yes ( ); No ( )

16. What safety facilities, services or regulations existing in Garibaldi Park are you aware of? (Please list:)_____

17. How do you feel about safety facilities, services and regulations in terms of your desired wilderness experience(s) (e.g. solitude, challenge, adventure, etc.), in Garibaldi Park?

	Strongly Oppose	Oppose	Undecided	Support	Strongly Support
Signs identifying hazards	( )	( )	( )	( )	( )
Trail markers	( )	( )	( )	( )	( )
Warming huts	( )	( )	( )	( )	( )
Safety literature at trailheads	( )	( )	( )	( )	( )
Search and Rescue Service	( )	( )	( )	( )	( )
Mandatory sign-in/ sign-out procedures for trail users	( )	( )	( )	( )	( )
Enforced safety regulations	( )	( )	( )	( )	( )

18. With regard to safety, should mountain bikes be allowed in Garibaldi Park? Yes ( ); No ( )

19. Referring to the attached map of Garibaldi Park, please circle the area(s) that <u>you</u> consider to be most hazardous.

    On the map, please explain in a couple of words why you consider the area(s) to be hazardous.

20. Where do you live? (City/town and Province/state)_____
    _____

21. Where were you mostly brought up? city ( ); town ( ); rural area ( )

22. What is your occupation?_____

23. What is your educational background? Elementary school ( ); some High school ( ); High school completed ( ); some University ( ); University completed ( ); Graduate/Professional school ( ); Technical/Trade school ( ); Other (please specify:)_____
    _____

24. Which age group do you fit into? Between 10 and 20 ( ); 21-30 ( ); 31-40 ( ); 41-50 ( ); 51-60 ( ); 61-70 ( ); 71 and over ( )

25. Sex: Female ( ); Male ( )

26. Are there any additional comments that you would like to make? (Use back of page if necessary.)

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION

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Appendix 1.2

GARIBALDI PARK DAY AND NIGHT USE FROM JUNE TO SEPTEMBER, 1980 TO 1985 (VALUES ARE IN PARTIES OF 3 VISITORS)

	1980	1981	1982	1983	1984	1985	AVERAGE 1983-1985
WEDGEMOUNT	----	----	----	----	----	----	1100e
FITZSIMMONS	----	----	----	412+	920+	1610	1610e
CHEAKAMUS	----	----	----	1311	2759	2181	2084
BLACK TUSK	----	----	----	5258	5787	6912	5986
DIAMOND HEAD	----	----	----	3006	1730	2215	2317
PARK TOTAL	9388*	8669*	----	9987*	11196*	13951*	13097

\+ STATISTICS DO NOT COVER ENTIRE JUNE TO SEPTEMBER PERIOD
* ANNUAL PARK TOTAL VARIATIONS ARE DUE TO DIFFERENT SAMPLING METHODS
e ROUGH ESTIMATES BASED ON AUTOMOBILE NUMBERS, TRAIL REGISTER ENTRIES AND DISCUSSIONS WITH PARK STAFF

Spurce: (British Columbia. Ministry of Lands, Parks and Housing. February, 1981, 1982, 1984, 1985, 1986. Park Data Handbook)

Appendix 1.3

OPEN-ENDED QUESTIONNAIRE RESPONSE CLASSIFICATION CRITERIA

Questions #1, 4, 6, 8, 9, 10, 12, 14, 16, 19, 20, 22, and 23 from the Garibaldi Park safety study all involve some degree of questionnaire response classification due to their open-ended nature. It was necessary to list specific responses for each questionnaire and then generalize these responses so that more than one response could be included under each category.

#1. Backpacking and sightseeing were grouped together with hiking; the categories hiking/climbing and climbing/hiking were interpreted to mean the same thing; fishing, canoeing and swimming were generalized into water activities.

#4. In a situation where a route passed by an intermediate destination, or destinations, on way to a further destination, only the furthest destination (assuming there are not two routes to a destination) was listed; where there was more than one possible way to meet a final destination, the intermediate destinations were enclosed in brackets.

#6. Multiple responses and "other" responses were grouped under "other."

#8. "Other" responses were summarized under "yes" and "no" headings.

#9. Accident or mishap types were listed in the following order: injuries such as "ankle sprains," "broken bones," and "exposure;" then events were listed: "lost," "trips," "falls," etc.; and finally an "other" category was created. Recreation accident or mishap causes were grouped in the following order from the top of the table to the bottom: "psychological" causes, "natural" causes, "other human causes," and "other" causes.

#10. "Other" safety concerns were categorized as "no" or the responses were based on the number of concerns the respondents had -- for example, "two concerns."

#12. Other precautions taken were analyzed based on the number of additional precautions taken -- in order to see who took more precautions.

#14. The first response for each questionnaire was considered when analyzing the main source of wilderness safety information for each user.

#16. A yes/no format was devised for all possible safety facilities, services and regulations. Each questionnaire response was then evaluated based on which facilities, services and regulations were recorded in the answer. All regulations were mentioned, even if they did not mention safety.

#19. For each area where questionnaires were handed out -- for example, Diamond Head -- the qualitative responses explaining why perceived areas are dangerous were tabulated in frequency under a human hazard heading and three natural hazard headings. (The classification is explained further on p.54).

#20. The closest places of residence were listed more specifically than distant residences; for example, "Greater Vancouver," "Other B.C.," "Alberta," "Other Canada," etc.

#22. The occupation classification used the Canada Census classification and Thorsell's (1971) questionnaire results as a guide for classification.

#23. Technical/trade education was listed only when it appears alone or with "high school completed;" "other" educational backgrounds are just left as "other" -- they are tabulated.

Appendix 1.4

ORIGIN OF GARIBALDI PROVINCIAL PARK VISITORS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
GREATER VAN	91.3	72.1	82.1	56.5	93.5
BRIT. COL.	4.3	11.6	14.3	9.7	4.3
OTHER CANADA	---	4.7	---	12.9	---
WASH., U.S.A.	---	4.7	---	1.6	---
OTHER U.S.A.	---	7.0	---	8.9	2.2
EUROPE	4.3	---	3.6	8.9	---
ASIA	---	---	---	1.6	---
	N=23	N=43	N=28	N=124	N=46

Appendix 1.5

OCCUPATION CLASSES OF GARIBALDI PARK RESPONDENTS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Service	---	---	---	3.3	8.5
Management - administration, etc.	14.3	9.3	20.7	11.4	17.0
Farming, horticulture, animal husbandry	---	---	---	0.8	2.1
Natural science, engineering	28.6	20.9	20.7	15.4	14.9
Social science, etc.	4.8	7.0	---	8.1	6.4
Medicine & health	4.8	11.6	10.3	8.9	14.9
Student	4.8	11.6	10.3	17.9	8.5
Clerical	8.3	11.6	3.4	2.4	2.1
Other crafts & equipment operations	4.8	4.7	3.4	---	2.1
Homemaker	---	2.3	3.4	---	2.1
Fabricators, assemblers	9.5	---	---	3.3	2.1
Construction	4.8	2.3	---	4.1	2.1
Art, literature, recreation, etc.	4.8	---	6.9	4.9	2.1
Teaching	9.5	14.0	13.8	11.4	8.5
Forestry & logging	---	---	---	---	2.1
Sales	---	4.7	6.9	1.6	2.1
Unemployed	---	---	---	0.8	---
Transport equipment operator	---	---	---	0.8	---
Machining, etc.	---	---	---	1.6	---
Retired	---	---	---	1.6	2.1
Processing	---	---	---	0.8	---
Religion	---	---	---	0.8	---
	N=21	N=43	N=29	N=123	N=47

Appendix 1.6

HIGHEST LEVEL OF EDUCATION ATTAINED BY GARIBALDI PARK RESPONDENTS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Elementary school	---	---	---	0.8	---
Some high school	---	---	6.9	2.4	---
High school completed	13.0	7.0	6.9	9.8	8.5
Some university	26.1	20.9	20.7	17.1	14.9
University completed	34.8	25.6	31.0	22.8	27.7
Graduate/ professional school	17.4	39.5	27.6	40.7	29.8
Technical/trade school	4.3	7.0	6.9	6.5	14.9
Other	4.3	---	---	---	4.3
	N=23	N=43	N=29	N=123	N=47

Appendix 1.7

MAIN SOURCE OF WILDERNESS SAFETY INFORMATION

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Books	20.8	17.5	21.4	22.7	21.7
Reading	20.8	15.0	7.1	5.9	6.5
Specialty mags., etc.	---	5.0	---	2.5	2.2
Government publications	---	---	---	1.7	2.2
Park pamphlets/ information	---	2.5	10.7	2.5	---
Other pamphlets/ brochures	---	---	---	3.4	4.3
Newspapers	---	---	3.6	---	---
Sign boards	---	---	3.6	---	4.3
Maps	---	---	---	2.5	---
Weather reports	---	---	---	0.8	---
Television	---	---	---	---	2.2
Courses/lectures	---	7.5	7.1	5.0	8.7
School	4.2	2.5	---	4.2	---
University	---	---	3.6	---	---
Armed Forces	---	---	3.6	---	---
Organizations/ clubs	8.3	7.5	3.6	1.7	---
Scouts/guides	---	7.5	---	2.5	2.2
Park-forest agencies	4.2	7.5	---	1.7	2.2
Duke of Edinburgh award	---	---	---	0.8	---
Trail guides	---	---	---	0.8	---
Friends/others	12.5	17.5	10.7	13.4	21.7
Family	---	5.0	3.6	5.0	2.2
Relying on someone	---	---	3.6	---	---
Experience	12.5	5.0	3.6	14.3	10.9
Common sense	4.2	---	3.6	5.0	4.3
Myself	4.2	---	---	---	---
Grew up	---	---	---	0.8	---
None	4.2	---	10.7	1.7	2.2
Not interested	---	---	---	---	2.2
Other	4.2	---	---	0.8	---
	N=24	N=40	N=28	N=119	N=46

Appendix 1.8

SEX OF GARIBALDI PARK RESPONDENTS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Female	17.4	51.2	48.3	32.5	44.7
Male	82.6	48.8	51.7	67.5	55.3
	N=23	N=44	N=29	N=123	N=47

Appendix 1.9

PLACES THAT USERS WENT TO IN GARIBALDI PARK

WEDGEMOUNT LAKE AREA

	(%)
Wedgemount Lake	45.8
Wedge Mountain	33.3
Wedge Mtn. & Weart Mtn.	12.5
Cook Mountain	4.2
Rethel Creek at 2600 metres	4.2
	N=24

FITZSIMMONS AREA

	(%)
Singing Pass	38.1
Singing Pass & beyond	2.4
Ridge above Russet Lake hut	2.4
Russet Lake hut	31.0
Singing Pass & Cheakamus Lake	4.8
Musical Bumps & Singing Pass	16.7
Whirlwind & Fissile Peaks	4.8
	N=42

CHEAKAMUS LAKE

	(%)
Cheakamus Lake	62.1
Cheakamus & Helm Lakes	3.4
Cheakamus Lake & Helm Creek trail	6.9
Cheakamus Lake & Fitzsimmons Range	3.4
Cheakamus Lake & Whistler Mountain	3.4
Cheakamus Lake via Whistler Microwave	3.4
Cheakamus Lake & cable car	3.4
Cheakamus Lake & Elm Creek to Cinder Flats	3.4
Helm Creek trail	3.4
Helm Lake	3.4
Whistler Mountain	3.4
	N=29

DIAMOND HEAD

	(%)
Red Heather	12.2
Elfin Lakes	34.7
Gargoyles	20.4
Gargoyles & Opal Cone	2.0
Gargoyles & Rampart Ponds	4.1
Gargoyles & Mamquam Lake	4.1
Diamond Head	10.2
Opal Cone	4.1
Mamquam Lake	4.1
Mount Garibaldi	4.1
	N=49

BLACK TUSK

	(%)		(%)
Barrier Trail to 4 km point	0.8	Garibaldi Lake	22.8
Garibaldi L. & Taylor Meadows	8.9	Garibaldi Lake & meadows	8.9
Panorama Ridge	2.4	Panorama Ridge & Garibaldi L.	5.7
Panorama Ridge, Garibaldi Lake & Taylor Meadows	0.8	Helm Lake	0.8
Helm Lake & Garibaldi Lake	1.6	Helm Lake, Garibaldi Lake & Taylor Meadows	0.8
Helm Lake, Garibaldi Lake & Panorama Ridge	0.8	Helm Lake, Garibaldi Lake, Taylor Meadows & Panorama Ridge	0.8
Helm Glacier, Cinder Cone Garibaldi Lake	0.8	Helm Glacier & Panorama Ridge	0.8
Gentian Peaks & Panorama Ridge	0.8	Empetrum Ridge, Panorama Ridge & Garibaldi Lake	0.8
Empetrum Ridge, Helm Glacier, Panorama Ridge & Garibaldi L.	0.8	Empetrum Ridge, Helm Glacier & Panorama Ridge	1.6
Gentian & Clinker Peaks, Helm Lake, Panorama Ridge & Garibaldi Lake	0.8	Paradise Lookout, Cinder Cone, Helm Lake, Taylor Meadows & Garibaldi Lake	0.8
Price Mountain	1.6	Cheakamus trailhead	0.8
Black Tusk base	0.8	Black Tusk base, Helm Lake & Taylor Meadows	0.8
Black Tusk	8.9	Black Tusk & Garibaldi Lake	13.8
Black Tusk, Garibaldi Lake & Taylor Meadows	4.1	Black Tusk, Garibaldi Lake & Panorama Ridge	1.6
Black Tusk & Panorama Ridge	0.8	Black Tusk, Helm Lake, Taylor Meadows & Garibaldi Lake	1.6
Black Tusk, Helm Lake, Panorama Ridge & Garibaldi L.	0.8	Black Tusk, Helm Glacier, Panorama Ridge & Garibaldi L.	0.8
Black Tusk, Cinder Cone & Garibaldi Lake	0.8		

			N=125

Appendix 1.10

CONCERNS FOR HAZARDS IN GARIBALDI PARK

WEDGEMOUNT LAKE AREA (N=24)

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	25.0	41.7	20.8	4.2	8.3
Steep areas	16.7	20.8	29.2	25.0	8.3
Rough trail surfaces	50.0	16.7	29.2	4.2	---
Bears	66.7	29.2	4.2	---	---
Sunburn	33.3	37.5	12.5	8.3	8.3
Foul weather	33.3	33.3	25.0	8.3	---
Becoming lost	58.3	29.2	8.3	---	4.2
Exhaustion	50.0	29.2	16.7	4.2	---

FITZSIMMONS AREA (N=43)

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	41.9	32.6	4.7	18.6	2.3
Steep areas	25.6	34.9	25.6	4.7	9.3
Rough trail surfaces	37.2	32.6	18.6	9.3	2.3
Bears	32.6	46.5	16.3	4.7	---
Sunburn	16.3	27.9	25.6	25.6	4.7
Foul weather	41.9	34.9	14.0	7.0	2.3
Becoming lost	67.4	18.6	11.6	2.3	---
Exhaustion	48.8	39.5	9.3	2.3	---

CHEAKAMUS LAKE (N=26)

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	42.3	46.2	7.7	3.8	---
Steep areas	32.1	46.4	10.7	3.6	7.1
Rough trail surfaces	37.9	27.6	27.6	6.9	---
Bears	41.4	24.1	10.3	13.8	10.3
Sunburn	21.4	42.9	35.7	---	---
Foul weather	46.4	35.7	17.9	---	---
Becoming lost	66.7	14.8	11.1	3.7	3.7
Exhaustion	37.0	44.4	14.8	3.7	---

BLACK TUSK (N=121)

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	47.6	28.2	16.9	6.5	0.8
Steep areas	28.2	34.7	22.6	12.9	1.6
Rough trail surfaces	39.3	42.6	16.4	1.6	---
Bears	62.0	28.9	5.8	2.5	0.8
Sunburn	28.5	31.7	22.8	16.3	0.8
Foul weather	53.7	26.8	14.6	4.9	---
Becoming lost	73.0	19.7	4.1	1.6	1.6
Exhaustion	40.7	35.0	13.0	9.8	1.6

DIAMOND HEAD (N=48)

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	59.2	28.6	10.2	---	2.0
Steep areas	27.1	41.7	22.9	8.3	---
Rough trail surfaces	43.8	31.3	20.8	4.2	---
Bears	54.2	37.5	8.3	---	---
Sunburn	24.5	42.9	18.4	14.3	---
Foul weather	50.0	31.3	8.3	10.4	---
Becoming lost	60.4	25.0	10.4	4.2	---
Exhaustion	60.4	29.2	8.3	2.1	---

Appendix 1.11

THE MOST COMMON TYPE OF WILDERNESS RECREATION ACCIDENT OR MISHAP AS PERCEIVED BY GARIBALDI PARK RESPONDENTS

ACCIDENT OR MISHAP TYPE	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
INJURY					
Insect bites	---	---	---	0.9	---
Blisters on feet	---	4.9	---	3.4	---
Sprains or strains	8.3	9.8	7.1	5.2	2.1
Cuts	---	---	---	6.9	4.2
Wounds	---	---	---	0.9	---
Twisted ankles	8.3	19.5	28.6	20.7	14.6
Broken limbs	4.2	4.9	---	0.9	2.1
Sunburn	---	2.4	7.1	2.6	4.2
Exposure	20.8	12.2	7.1	15.5	14.6
Exhaustion	---	---	---	5.2	2.1
Injury	4.2	---	---	---	---
EVENTS					
Caught by bad weather	---	---	3.6	1.7	2.1
Avalanche	---	2.4	3.6	---	2.1
Falling rocks	---	---	---	0.9	---
Lost	33.3	9.8	10.7	9.5	12.6
Tripping	---	2.4	---	3.4	4.2
Falls	4.2	17.1	21.4	14.7	22.9
Falls - minor injuries	4.2	2.4	---	1.7	2.1
Falls - major injuries	8.3	---	3.6	---	---
Overdue hikers	4.2	2.4	---	0.9	---
Skiing	---	4.9	---	---	2.1
Climbing accidents	---	---	---	1.7	---
Wood cutting	---	2.4	---	---	---
Drowning	---	---	3.6	---	---
4X4 collision	---	---	3.6	---	---
OTHER					
Over-exertion	---	---	---	---	2.1
Ill-equiped	---	---	---	---	2.1
No risk if go by the rules	---	---	---	0.9	---
Nievity in physical conditioning	---	---	---	0.9	---
Don't know	---	2.4	---	1.7	4.2
	N=24	N=41	N=28	N=125	N=48

Appendix 1.12

MOST COMMON CAUSE OF WILDERNESS RECREATION ACCIDENT OR MISHAP AS PERCEIVED BY GARIBALDI PARK RESPONDENTS

ACCIDENT OR MISHAP CAUSE	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
PSYCHOLOGICAL					
Inexperience	20.8	9.8	3.8	8.8	8.7
Ignorance	---	2.4	7.7	8.8	6.5
Carelessness	8.3	9.8	15.4	17.7	10.9
Over-confidence	4.2	---	---	0.9	2.2
Environmental awareness	---	2.4	---	2.7	---
Stupidity	---	---	---	---	2.2
Impatience	---	2.4	---	---	---
Recklessness	---	---	3.8	---	---
Risk-taking	---	---	---	1.8	---
Inattentiveness	---	---	---	6.2	---
Education	---	---	---	---	2.2
Underestimating terrain	4.2	---	---	---	2.2
Try to travel to far	4.2	2.4	---	---	---
NATURAL CAUSES					
Mother Nature	---	---	---	0.9	2.2
Terrain	4.2	2.4	3.8	1.8	2.2
Trail surfaces	---	9.8	3.8	2.7	4.3
Trail markers	4.2	---	---	---	---
Weather	4.2	---	---	0.9	---
Sun	---	---	3.8	---	2.2
Vehicle access	---	---	3.8	---	---
Length of walk	---	---	---	0.9	---
OTHER HUMAN CAUSES					
Lost	---	---	---	---	2.2
Falls	4.2	---	---	---	2.2
Tripping	---	---	---	0.9	---
Solo ascents	4.2	---	---	---	---
Slipping	4.2	---	---	0.9	---
Slipping on ice	---	2.4	---	---	---
Not following trail	---	2.4	---	2.7	---
Missed footing	---	---	3.8	---	---
Leaving the trail	---	---	3.8	0.9	2.2
Travelling too fast over rough terrain	---	2.4	---	---	---
Poor balance &	---	---	---	---	2.2

concentration					
Skiing	---	---	3.8	---	---
Hiking	---	---	---	0.9	---
Exhaustion	8.3	4.9	---	9.7	10.9
Over-exertion	---	---	3.8	1.8	---
Ill-equiped	---	9.8	---	0.9	4.3
Poor footwear	---	7.3	11.5	5.3	8.7
Improper preparation	20.8	19.5	15.4	13.3	10.9
Out-of-shape	---	---	3.8	3.5	2.2
Lack of warm clothes	---	---	3.8	0.9	---
Lack of adequate protection	---	---	---	---	2.2
Improper food	---	---	---	---	2.2
Heavy packs	---	---	---	0.9	---
OTHER					
Park is too accessible	---	2.4	---	---	---
Excessive reproduction	---	---	---	0.9	---
Wood choppers	---	2.4	---	---	---
Chance situation	---	2.4	---	1.8	---
No supervision	---	---	3.8	---	---
Don't know	---	2.4	---	0.9	4.3
	N=24	N=41	N=26	N=113	N=46

Appendix 1.13

REASONS GIVEN FOR PERCEIVING AREAS AS HAZARDOUS WITHIN THE FIVE GARIBALDI PARK REGIONS -- EXPRESSED AS PERCENTAGE OF RESPONDENTS

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Topography &/or geology	62.5	62.5	23.1	46.2	48.0
Human	18.8	---	23.1	22.5	4.0
Weather &/or climate	---	4.2	---	---	4.0
Water bodies	---	---	23.1	1.2	---
Other	12.5	20.8	15.4	21.2	28.0
No response	6.3	12.5	15.4	8.7	16.0
	N=16	N=24	N=13	N=80	N=25

Appendix 1.14

PERCENTAGE OF GARIBALDI PARK RESPONDENTS WHO HAD DONE THEIR TRIP BEFORE

WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
29.2	30.2	24.1	38.7	44.9
N=24	N=43	N=29	N=124	N=49

Appendix 1.15

PERCENTAGE OF RESPONDENTS WHO HAVE BEEN TO DIFFERENT AREAS OF GARIBALDI PARK

WEDGEMOUNT	FITZSIMMONS	CHEAKAMUS	BLACK TUSK	DIAMOND HEAD
(%)	(%)	(%)	(%)	(%)
82.6	68.6	68.2	40.6	85.7
----	----	----	----	----
N=23	N=35	N=22	N=106	N=35

Appendix 1.16

USER AWARENESS OF SAFETY FACILITIES, SERVICES AND REGULATIONS IN GARIBALDI PARK

	WEDGEMOUNT	FITZSIMMONS	CHEAKAMUS	BLACK TUSK	DIAMOND HEAD
	(%)	(%)	(%)	(%)	(%)
Shelters	62.5	33.3	25.0	35.7	56.8
First-aid equipment	4.2	2.6	3.6	0.9	2.3
Access roads	4.2	2.6	0.0	0.0	2.3
Park personnel	41.7	35.9	42.9	66.1	45.5
Search & Rescue	29.2	15.4	0.0	7.8	11.4
R.C.M. Police	20.8	5.1	0.0	0.9	0.0
Emergency phone#	0.0	0.0	10.7	0.0	2.3
Register	20.8	20.5	17.9	8.7	15.9
Safety literature	0.0	0.0	0.0	0.9	4.5
Trailhead information	8.3	7.7	7.1	7.8	11.4
Notice boards	0.0	10.3	3.6	1.7	2.3
Maps	20.8	7.7	21.4	13.9	18.2
Park lectures, tours	0.0	0.0	0.0	3.5	0.0
Warning signs	8.3	0.0	7.1	25.2	13.6
Trail markers	16.7	20.5	21.4	30.4	27.3
Trail construction	4.2	7.7	3.6	7.0	6.8
Garbage removal	0.0	0.0	0.0	0.9	0.0
Bear removal	0.0	0.0	0.0	0.9	0.0
Other hikers	0.0	0.0	0.0	0.9	0.0
Water	0.0	2.6	0.0	1.7	0.0
Regulations	16.7	15.4	17.9	31.3	11.4
Other safety facilities	20.8	5.1	3.6	13.9	6.8
Unaware of safety facilities, services or regulations	12.5	15.4	10.7	7.0	11.4
	----	----	----	----	----
	N=24	N=39	N=28	N=115	N=44

Appendix 1.17

ATTITUDES TOWARD SAFETY MANAGEMENT IN GARIBALDI PARK

WEDGEMOUNT LAKE (N=23)

	STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
Signs identifying hazards	4.3	13.0	13.0	34.8	34.8
Trail markers	---	4.2	---	37.5	58.3
Warming huts	---	---	8.3	54.2	37.5
Safety literature at trailheads	---	4.2	4.2	45.8	45.8
Search & rescue	---	---	8.3	37.5	54.2
Mandatory sign-in & sign-out for trail users	16.7	4.2	33.3	29.2	16.7
Enforced safety regulations	20.8	20.8	20.8	29.2	8.3

FITZSIMMONS (N=40)

	STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
Signs identifying hazards	---	5.0	5.0	40.0	50.0
Trail markers	---	---	---	33.3	66.7
Warming huts	---	4.8	11.9	50.0	33.3
Safety literature at trailheads	---	2.4	7.3	46.3	43.9
Search & rescue	---	---	7.1	45.2	47.6
Mandatory sign-in & sign-out for trail users	7.0	14.0	20.9	27.9	30.2
Enforced safety regulations	2.4	14.3	28.6	26.2	28.6

CHEAKAMUS LAKE (N=27)

	STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
Signs identifying hazards	3.4	---	6.9	51.7	37.9
Trail markers	---	---	---	40.7	59.3
Warming huts	---	6.9	6.9	48.3	37.9
Safety literature at trailheads	---	3.4	13.8	41.4	41.4
Search & rescue	3.4	---	7.1	51.7	44.8
Mandatory sign-in & sign-out for trail users	3.4	13.8	27.6	17.2	37.9
Enforced safety regulations	7.1	7.1	14.3	42.9	28.6

BLACK TUSK (N=119)

	STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
Signs identifying hazards	1.7	4.2	5.0	46.2	42.9
Trail markers	0.8	0.8	1.6	42.3	54.5
Warming huts	3.3	4.9	17.9	46.3	27.6
Safety literature at trailheads	0.8	4.8	9.7	49.2	35.5
Search & rescue	0.8	1.7	5.8	44.2	47.5
Mandatory sign-in & sign-out for trail users	7.3	22.0	22.8	25.2	22.8
Enforced safety regulations	9.8	16.4	21.3	32.0	20.5

DIAMOND HEAD (N=47)

	STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
Signs identifying hazards	4.3	8.5	6.4	36.2	44.7
Trail markers	---	---	---	38.3	61.7
Warming huts	---	4.3	17.0	44.7	34.0
Safety literature at trailheads	---	2.1	6.4	42.6	48.9
Search & rescue	---	---	10.6	38.3	51.1
Mandatory sign-in & sign-out for trail users	8.5	21.3	14.9	29.8	25.5
Enforced safety regulations	8.5	27.7	19.1	27.7	17.0

Appendix 2. Data For Chapter Five

Appendix 2.1

PROPORTION OF USERS WHO TOOK PRECAUTIONS IN GARIBALDI PROVINCIAL PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Checked weather report	87.5	62.8	48.3	64.5	69.4
Left message telling where you were going	66.7	76.7	51.7	69.4	52.1
First-aid kit	66.7	51.2	37.9	53.2	55.1
Flashlight	66.7	23.3	24.1	31.5	36.7
Map of area	62.5	62.8	51.7	66.1	49.0
Extra food	75.0	69.8	69.0	58.1	65.3
Extra clothing	87.5	83.7	69.0	78.2	73.5
Wore hiking boots	79.2	60.5	34.5	50.0	53.1
Other	+ 66.7	+ 32.6	+ 17.2	+ 30.6	+ 8.8
SUB-TOTAL	658.6	523.4	403.4	501.6	463.0
No particular precautions taken	- 0.0	- 2.3	- 10.3	- 4.0	- 4.1
TOTAL	658.5	521.1	393.1	496.6	458.9

Appendix 2.2

NUMBER AND INTENSITY OF CONCERNS IN GARIBALDI PARK

WEDGEMOUNT LAKE AREA

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	25.0	41.7	20.8	4.2	8.3
Steep areas	16.7	20.8	29.2	25.0	8.3
Rough trail surfaces	50.0	16.7	29.2	4.2	---
Bears	66.7	29.2	4.2	---	---
Sunburn	33.3	37.5	12.5	8.3	8.3
Foul weather	33.3	33.3	25.0	8.3	---
Becoming lost	58.3	29.2	8.3	---	4.2
Exhaustion	50.0	29.2	16.7	4.2	---
				----	----
				54.2	29.1

54.2(LARGE AMOUNT) + 29.1(EXTREME AMOUNT) = 83.3 (TOTAL PERCENTAGE)

FITZSIMMONS AREA

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	41.9	32.6	4.7	18.6	2.3
Steep areas	25.6	34.9	25.6	4.7	9.3
Rough trail surfaces	37.2	32.6	18.6	9.3	2.3
Bears	32.6	46.5	16.3	4.7	---
Sunburn	16.3	27.9	25.6	25.6	4.7
Foul weather	41.9	34.9	14.0	7.0	2.3
Becoming lost	67.4	18.6	11.6	2.3	---
Exhaustion	48.8	39.5	9.3	2.3	---
				----	----
				74.5	20.9

74.5(LARGE AMOUNT) + 20.9(EXTREME AMOUNT) = 95.4 (TOTAL PERCENTAGE)

CHEAKAMUS LAKE

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	42.3	46.2	7.7	3.8	---
Steep areas	32.1	46.4	10.7	3.6	7.1
Rough trail surfaces	37.9	27.6	27.6	6.9	---
Bears	41.4	24.1	10.3	13.8	10.3
Sunburn	21.4	42.9	35.7	---	---
Foul weather	46.4	35.7	17.9	---	---
Becoming lost	66.7	14.8	11.1	3.7	3.7
Exhaustion	37.0	44.4	14.8	3.7	---
				35.5	21.1

35.5(LARGE AMOUNT) + 21.1(EXTREME AMOUNT) = 56.6 (TOTAL PERCENTAGE)

BLACK TUSK

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	47.6	28.2	16.9	6.5	0.8
Steep areas	28.2	34.7	22.6	12.9	1.6
Rough trail surfaces	39.3	42.6	16.4	1.6	---
Bears	62.0	28.9	5.8	2.5	0.8
Sunburn	28.5	31.7	22.8	16.3	0.8
Foul weather	53.7	26.8	14.6	4.9	---
Becoming lost	73.0	19.7	4.1	1.6	1.6
Exhaustion	40.7	35.0	13.0	9.8	1.6
				56.1	7.2

56.1(LARGE AMOUNT) + 7.2(EXTREME AMOUNT) = 63.3 (TOTAL PERCENTAGE)

DIAMOND HEAD

	NONE (%)	SOME (%)	MODERATE AMOUNT (%)	LARGE AMOUNT (%)	EXTREME AMOUNT (%)
Exposure	59.2	28.6	10.2	---	2.0
Steep areas	27.1	41.7	22.9	8.3	---
Rough trail surfaces	43.8	31.3	20.8	4.2	---
Bears	54.2	37.5	8.3	---	---
Sunburn	24.5	42.9	18.4	14.3	---
Foul weather	50.0	31.3	8.3	10.4	---
Becoming lost	60.4	25.0	10.4	4.2	---
Exhaustion	60.4	29.2	8.3	2.1	---
				43.5	2.0

43.5(LARGE AMOUNT) + 2.0(EXTREME AMOUNT) = 45.5 (TOTAL PERCENTAGE)

Appendix 2.3

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Less than 1 year experience in activity	8.3	7.0	7.4	13.0	4.1
Have not been lost or involved in a wilderness recreation mishap	62.5	83.7	86.2	82.3	75.0
Percentage of respondents who had not done their trip before	70.8	69.8	75.9	61.3	55.1
Had never been to Garibaldi Park before	+ 16.7	+ 26.2	+ 13.8	+ 47.6	+ 14.9
TOTAL	158.3	186.7	183.3	204.2	149.1

Appendix 2.4

MAIN MOTIVATION FOR COMING TO GARIBALDI PARK

	WEDGEMOUNT (%)	FITZSIMMONS (%)	CHEAKAMUS (%)	BLACK TUSK (%)	DIAMOND HEAD (%)
Challenge & risk	20.8	---	---	2.4	---

Appendix 2.5

ATTITUDES TOWARD SAFETY MANAGEMENT IN GARIBALDI PARK

WEDGEMOUNT LAKE

STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
4.3	13.0	13.0	34.8	34.8
---	4.2	---	37.5	58.3
---	---	8.3	54.2	37.5
---	4.2	4.2	45.8	45.8
---	---	8.3	37.5	54.2
16.7	4.2	33.3	29.2	16.7
+ 20.8	+ 20.8	20.8	+ 29.2	+ 8.3
41.8	46.4		268.2	255.6

SUPPORT - OPPOSE = (268.2 + 255.6) - (41.8 + 46.4) = 435.6

FITZSIMMONS

STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
---	5.0	5.0	40.0	50.0
---	---	---	33.3	66.7
---	4.8	11.9	50.0	33.3
---	2.4	7.3	46.3	43.9
---	---	7.1	45.2	47.6
7.0	14.0	20.9	27.9	30.2
+ 2.4	+ 14.3	28.6	+ 26.2	+ 28.6
---	---		---	---
9.4	40.5		268.9	300.3

SUPPORT - OPPOSE = (268.9 + 300.3) - (9.4 + 40.5) = 519.3

CHEAKAMUS LAKE

STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
3.4	---	6.9	51.7	37.9
---	---	---	40.7	59.3
---	6.9	6.9	48.3	37.9
---	3.4	13.8	41.4	41.4
3.4	---	7.1	51.7	44.8
3.4	13.8	27.6	17.2	37.9
+ 7.1	+ 7.1	14.3	+ 42.9	+ 28.6
---	---		---	---
17.3	31.2		293.9	287.8

SUPPORT - OPPOSE = (293.9 + 287.8) - (17.3 + 31.2) = 533.2

BLACK TUSK

STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
1.7	4.2	5.0	46.2	42.9
0.8	0.8	1.6	42.3	54.5
3.3	4.9	17.9	46.3	27.6
0.8	4.8	9.7	49.2	35.5
0.8	1.7	5.8	44.2	47.5
7.3	22.0	22.8	25.2	22.8
+ 9.8	+ 16.4	21.3	+ 32.0	+ 20.5
---	---		---	---
24.5	54.8		285.4	251.3

SUPPORT - OPPOSE = (285.4 + 251.3) - (24.5 + 54.8) = 457.4

DIAMOND HEAD

STRONGLY OPPOSE (%)	OPPOSE (%)	UNDECIDED (%)	SUPPORT (%)	STRONGLY SUPPORT (%)
4.3	8.5	6.4	36.2	44.7
---	---	---	38.3	61.7
---	4.3	17.0	44.7	34.0
---	2.1	6.4	42.6	48.9
---	---	10.6	38.3	51.1
8.5	21.3	14.9	29.8	25.5
+ 8.5	+ 27.7	19.1	+ 27.7	+ 17.0
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21.3	63.9		257.6	282.9

SUPPORT - OPPOSE = (257.6 + 282.9) - (21.3 + 63.9) = 455.3

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